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Undergraduate Project Report

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The Design and Implementation of a Website for Natural Disaster Monitoring based on Multiple Social Media

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Abstract

This project aims to design and implement an online system for visualizing the relevant and digitized disaster information that hidden in multiple social media platforms.

The system has successfully display valuable information from social media like Weibo and SINA News. In order to intuitively exhibit the source data in a systematic way, I requested analysed attributes of disasters from our back-end system and gathered dozens of relevant data to form an ‘Event’.

In such ‘event’, the system adopted manifold approaches and diagrams to demonstrate the information not limited to table list, knowledge graph, charts, diagrams and map, etc. Moreover, I also deployed structured timeline or event-line to compare supposed attributes, similarities and correlations among different events, which provide a macroscopical view for relevance description or recommendation.

The system also includes user functions like account login/out, information management, role management, etc. Those customization functions and humanized system logic will provide favourable experience for all the users in the system.

This front-end system is now successfully deployed on <http://152.136.59.62/>. In order to update our pages in real time, processed data is requested and transmitted from our backend asynchronously.

摘要

这个项目致力于可视化隐藏在多源社交媒体平台上的有关于灾害的数字化信息，并设计、搭建在线系统进行合理展示。

到目前为止，该系统已经成功展示了来自“微博”以及“新浪新闻”两种社交媒体中有关于“地震”该种灾害类型的珍贵信息。为了能够以更加直观和系统的方式可视化数据，我从后端系统异步请求单次地震的不同属性数据，并仔细将相关信息进行融合，构建成为‘事件’页面。

在单一‘事件’页面当中，系统将采用多样化的组件和展示方式来表现数据，不仅仅拘束于列表、图谱、图表、地图等形式。此外，通过比较不同事件的数据属性、相同点/不同点、关联性等因素，我采用了事件线或者时间线的形式串联了起来，并将从宏观的角度出发给用户提供关联解释和相关推荐。

该系统也包含部分用户操作功能，例如登录、登出、个人信息管理、角色管理等。该类人性化的定制功能，以及科学的系统逻辑，将更好地提升用户体验，更能从‘系统’的角度完善我们的项目。

该系统现在已经成功部署在服务器上，域名地址为：<http://152.136.59.62/>。为了能够实时更新我们的系统，后端处理、分析过的数据将被异步请求并传送至我们的前端页面。

Chapter 1: Introduction

1.1 General Introduction

As usual, people will seek information for those disasters in authoritative platforms such as official earthquake website or Government News, whose data is directly measured and detected by accurate instruments. However, people seldom associated social media information with general earthquake disasters.

In this aspect, we supposed that source message published on social media such as Weibo and News platforms are full of valuable information and statistical data. People might publish such information through personal publications, comments, diary/event records, official news, even short videos, etc. Through carefully text-analysed and classified, valid and authentic information could be extracted and concluded to certain events as significant attributes.

Our team's goal is to crawl those hot issue and popular message from mainstream platforms, then filter them through our designed database and trainer models.

Then, the goal of this project is to design and implement an online website for displaying the analysed and formatted data, with multiple kinds of tools from different perspectives.

1.2 Function Definition

This system is implemented on our server with adequate carefully designed functionalities.

- Index for pages direction, time-varying processed data exhibition, magnitude classification and general data distribution.
- Multiple plugins and interfaces for data visualization and components arrangements.
- Data distribution and location marker on China map.
- Data list and general information for earthquake 'event'.
- Detail information for single selected event, including heat line, word clouds, data classification, data distribution, timeline, knowledge map and source data list.
- Redirection from map marker and region label and information re-search on horizontal timeline.
- Public opinion information and News information in real time.
- Source Weibo specification and relevant information query through word clouds.
- User functions like login/out, information management, role management, etc.
- Documentation page as user manual and nouns/logic explanation, update records.

1.3 Novelty and Innovation

Our project also specifies some novelties of the approach used.

1. I adopted Vue framework for my development, which sustains reactive and composable view components. It will provide code with better control and higher degree of fluency by differentiating front-end structure into ‘Model’ ‘View’ and ‘Controller’.
2. My system adopts front end and back-end separation technology, which allow me to develop my code without interfering our team members’ progression. It provides great flexibility to our synergy when cooperating or debugging.
3. All of the information in my front-end system is updated in real time. Each request in every front-end page is asynchronously sent to fetch data so as to remain page integrity and content freshness.
4. Sufficient information is classified and concluded to certain earthquake ‘event’. In this way, I could better describe our data with multiple forms in different categories based on their ‘attributes’, including map, charts, list, diagrams, etc.
5. One of the important aspects of my system is the arrangement of event-line or timeline. Through those two means, our system is able to introduce relevant information and improve the consistency. History could also be recommended, and knowledge map is adopted for relevance description.
6. I implement several functions like ‘information management’, ‘role management’ or ‘log in/out’ from the perspective of user, which enables the project to become more systematic and intact.

Chapter 2: Background

2.1 VUE

To enrich my understanding about front end framework, I have devoted great time in the VUE framework deployment (VueJS, 2017) and related configuration knowledge, code learning and implementation knowledge. The framework that I am going to introduce my background is demonstrated in Figure 1.

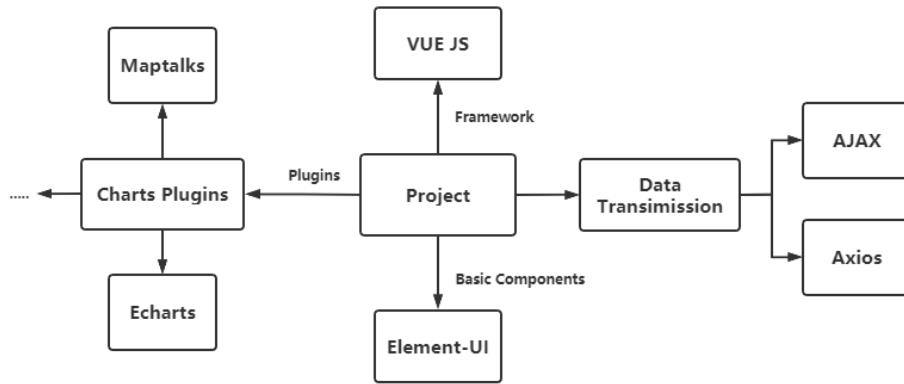


Figure 1 Background Information Introduction

Knowledge of VUE framework was accumulated and learned by during the early stage of my thesis project, including a lot of material packs and configuration file. I have learned about VUE syntax and code block knowledge from channels such as CSDN, W3School, GitHub, CNBlog, etc. Those platforms provide sufficient materials and examples of both VUE implementation and modification, also relevant questions to solve.

2.1.1 Front and Back-end Separation

VUE adopts front and end separation technology, which is quite useful for modern development cooperation. The front-end project based on VUE framework is separated and individually exploited by me and will not affected backend development process (Sun Sijie, 2020). The lightweight VUE-Js exploitation provide great flexibility for API calling and lower code coupling.

After those work, I claimed to have a good understanding of VUE's code composition, instance implementation, logic, and property configuration. The pages contain VUE entities were

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carefully modified and given the attributes to meet our purpose design, in which case shown the application of my knowledge.

2.2 Element-UI

The whole main skeleton and important material package of my project is based on Element-UI (Element-Ui, 2020). It's a powerful PC component library for developer who implements VUE framework. I made use of the elements with each edition of my project recording the solution and methods on Element-UI, those significant and convenient components concisely satisfy my needs of website interface construction, and purpose of our data exhibition.

E-charts is one of the most use graph library for my data visualization and charts instantiation (E-Charts, 2017). Data comparison like certain pie charts, heat line, China map for distribution is all implemented through E-charts package. It renders image and correspond activation in high speed, with beautifully design style and humanized floating prompt.

2.3 MapTalks

MapTalks (MapTalks, 2017), an open-source JavaScript library to create integrated 2D/3D maps with essential features for mapping projects. It portrays another important role in my project and brings data to maps by web standards, with Canvas, WebGL and other techniques like SVG/CSS3/HTML, full capabilities of modern browsers.

After learning their critical samples and variables assignment way, I have a command of their usual application about layer introduce and component declarations. In my map label page, I adopt MapTalk's China layer and markers for earthquakes' location specification.

2.4 Data Transmission

In my project, AJAX and AXIOS are adopted for data transmission (Qiu Heng, 2020). In order to meet our demand of updating the data asynchronously, AJAX provides great flexibility, which responds to user's actions and maintain such data without refreshing the whole page or sending some unchanged information.

Actually, AJAX does not require any browser plugins and it provides great privilege to platform's security and rendering speed. In VUE packet, AJAX is packaged into AXIOS and provide more convenient and pointed implementation.

2.5 JsDeliver

CDN is a content distribution network built on the network. It relies on the edge servers deployed in various places, and through the load balancing, content distribution, scheduling and other functional modules of the central platform, users can get the required content nearby, reduce network congestion, and improve the user's access response speed and hit rate.

In this aspect, JsDelivr is a free and open source CDN solution designed to help developers and webmasters. Contains JavaScript libraries, jQuery plug-ins, CSS frameworks, fonts, and other static resources commonly used on the Web.

In order to employ JsDelivr, we first establish a GitHub repository and cloned it in the local environment after the git and SSH is configurated. Then we push the static files we need to our GitHub repository and drag a new release. With the release version No, we are able to import the resource by calling the URL

<https://cdn.jsdelivr.net/gh/username/repository@release-version/file-path>

Static information in our page is loaded through JsDelivr and stored in my repository ‘Resources’, including description for system functions and arguments in documentation page, introduce video in index page (not recorded yet), some important pictures and graphs, draft videos, etc.

master		1 branch	5 tags	Go to file	Add file	Code
	lhx02263	Update Description.md	b5f71eb	20 days ago	16 commits	
	A_1.mp4	video2		3 months ago		
	Description.md	Update Description.md		20 days ago		
	ToGithub.jpg	Add files via upload		2 months ago		
	video.mp4	video		3 months ago		

Figure 2 System Documentation on GitHub

2.6 Data Visualization

According to the platform’s demand, the kind and datatype that we used for visualization will be various, including structured data (He Wei, 2020), semi-structured data and non-structured data. We should fuse our collected data into the form that we need and then clean or transform with accuracy. Since data from different domain usually obtains different ways of expression, distributions and scale, so I should devote tremendous work in data integration.

2.6.1 Data Analysis

Data analysis does not mean defining or visualizing the original data in a brief way. In this case, analyst's comprehension and interpret ability towards his data will be of great beneficial to visualization.

Meanwhile, analyst is required to conduct interactive exploration, which realize the circulation process of visualization analysis [Fig. 3], until application demand is satisfied. In the procedure of analysis, analyst should first hold an overall outline analysis to figure out the most significant points, which are really useful to data refinement and filtration in later time (Zhu Guanghua, 2017). Since then, analyst should try to dig out the relevance information and causal relationship between different data.

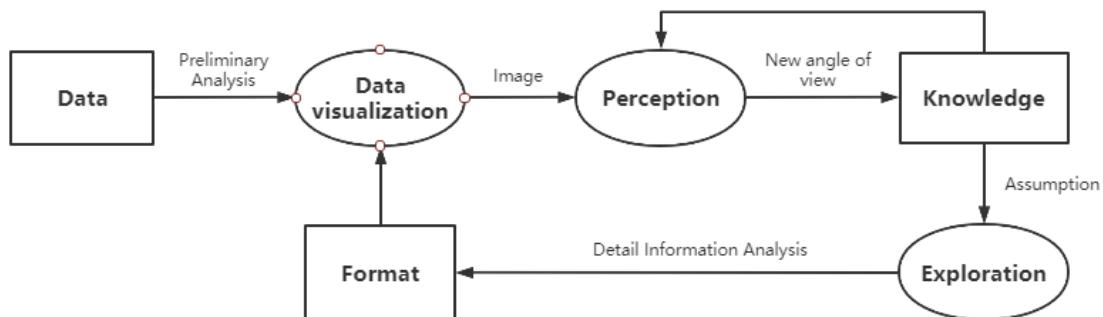


Figure 3 The model of visual analysis loop

2.6.2 Text Visualization

Text visualization [Fig.4] about social media platforms include key words visualization, theme and emotion visualization. Through those three parameters, analyst could conclude abundant semantic information.

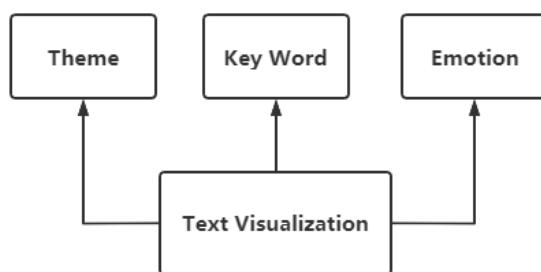
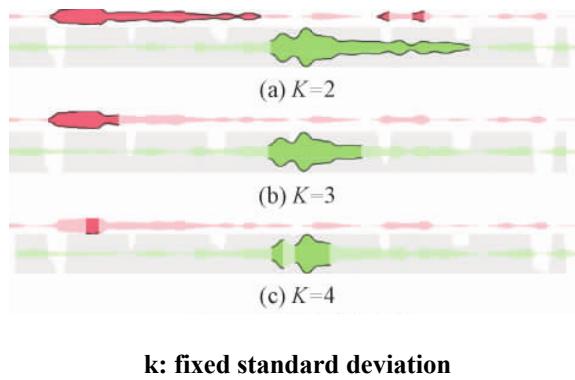


Figure 4 Text Visualization Model

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Keywords are those words which shows up in articles with high frequency. Word cloud is frequently used for key words extraction, which list a series of words on a plane and stipulate that the bigger the word is, the more frequent the word will show up.

Theme is the abstract of certain media content. Extracting the media theme is crucial for revealing the user understanding of the content itself. In this part, it is rational to adopt theme river for exhibiting the evolution process of the content according to the time (He Wei, 2020). Parallel river [Fig. 5] indicates different themes that derived from one single event and the fluctuation manifest the information amount or heat that around a theme as time goes by. On account of the impact among different users, different themes in one single event also produce competitive behaviour, which leads to various stage of present, development, replacement and extinction.



k: fixed standard deviation

Figure 5 Parallel river, used for visualizing dynamic events

Emotion is extracted as user's attitude from his expression or text, which is another important aspect for text analysis. After applying certain algorithm to extract emotion from text and apply interactive visualization, analyst is able to explore critical problem and have a good command of public mood.

Chapter 3: Design and Implementation

3.1 Structural Design

User interfaces are approximately designed and shown in 9 different pages. Interfaces under production environment is almost the same with interfaces in formal user environment after the updates. They are ‘index’, ‘earthquake events’, ‘detail information’, ‘opinion information’, ‘earthquake distribution’, ‘user management’, ‘role management’, ‘documentation’ and ‘personal information’.

Logical workflow is generated as expressed as a flowchart in the figure below [Fig. 1]. It is adjusted and optimized for several times, since sometimes we are not so satisfied with the page or logical design of our system.

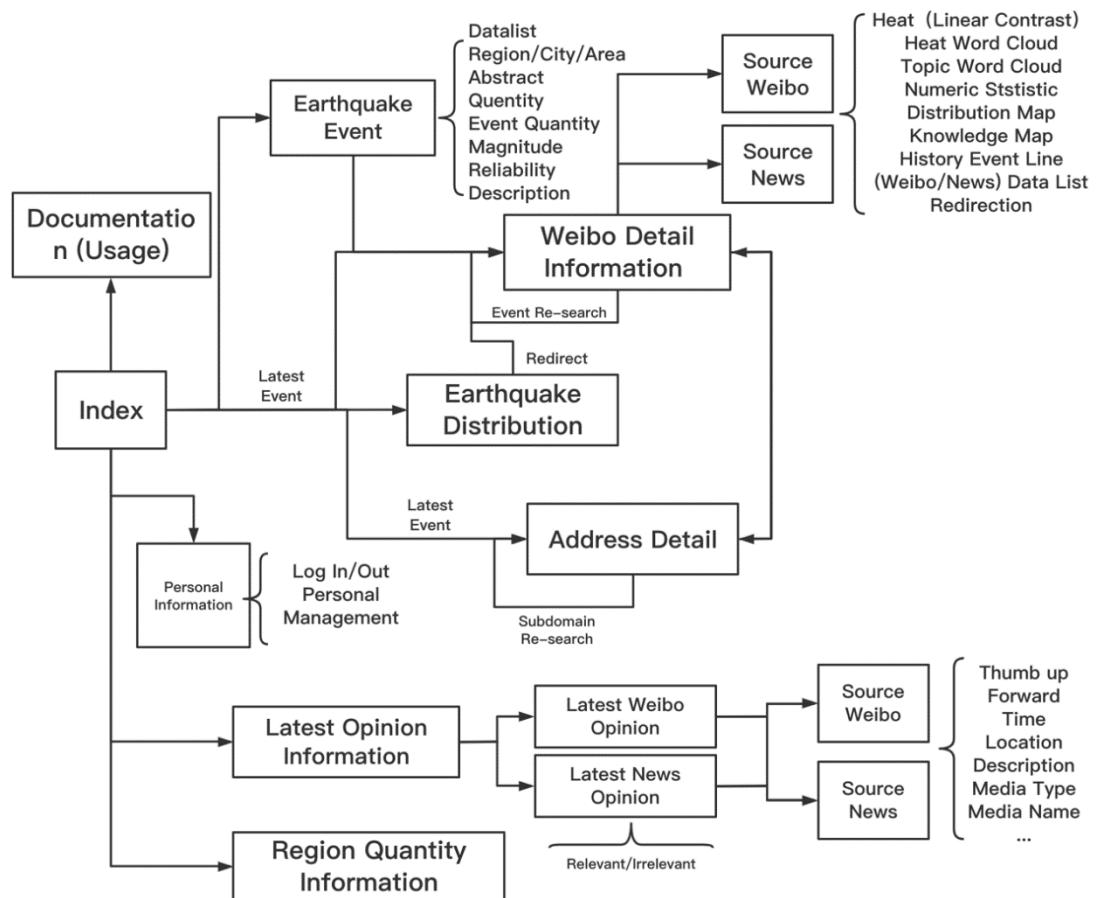


Figure 6 Logical Flowchart

We intended to emphasize that the system should be integrated, interactive and hierarchical which provides our user a sense of wholeness and friendliness. Through our hard work, it is structures into more intact and manifold chart with updated functions and modifications, rather than simply exhibiting some statistical data on cards.

3.2 Project Package Design

In order to implement our project, I learned and borrowed the framework based on Vue-JS and design a package for project deployment. It is quite similar to the structure of projects that could be searched or referenced on GitHub since it obtains a high level of unity and rationality.

In this part, I will gradually introduce my package design in each layer of my work and carefully explain their functionalities in this project.

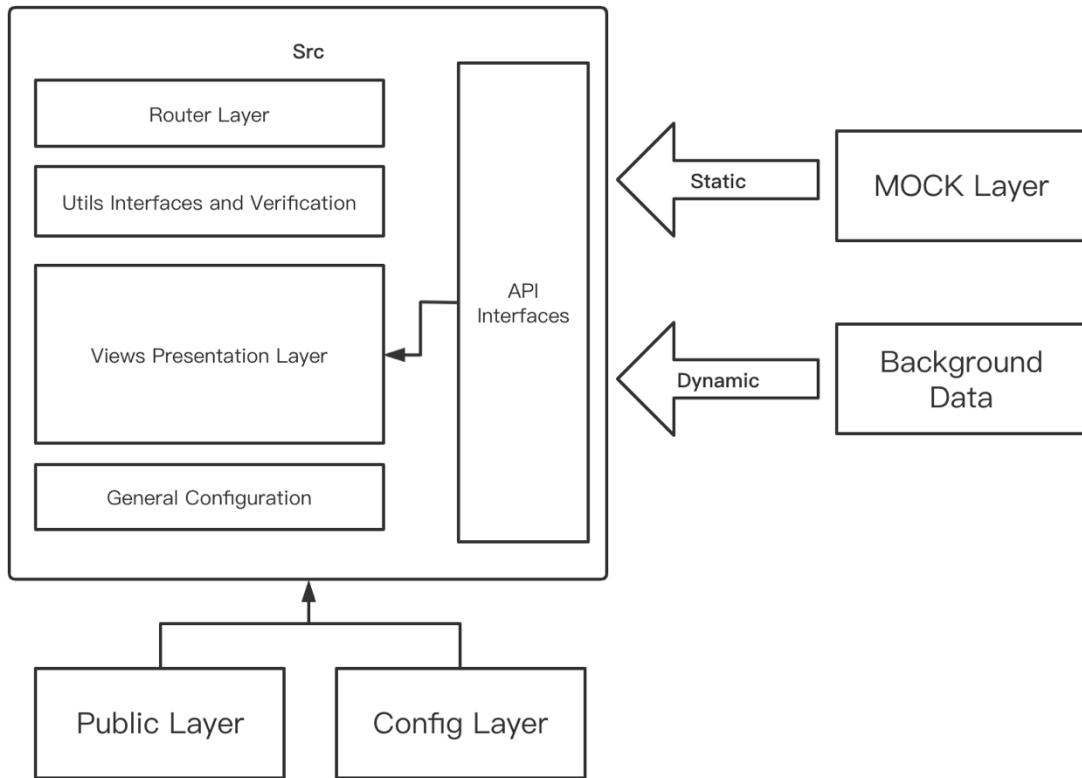


Figure 7 Project package design

3.2.1 Data Layer

Data layer is consisting of two layers which are called the ‘Mock’ layer and ‘Background Data’ layer.

‘Mock’ layer is employed for the static data which will automatically loaded when the page is formed without requests or responds with the sever. It constitutes multiple ‘APIs’ which forge data in static JS and return to the Source Layer. Static data is really useful for those fixed pages rendering which do not require frequent updates. For example, some written messages in documentation page or update log are used for functions and progress explanations, so we wrote this message in static mock layer.

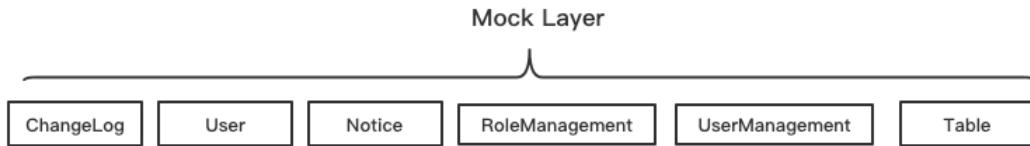


Figure 8 Mock Layer for Static Data Respond

‘Background Data’ stands for that information which is requested and respond from our back-end system. From our GitHub documentation, you could find all our link URLs with functions definition including the meaning of their ‘Link-Type’ and ‘Link-No’. Usually, this kind of information is arranged in the form of

`http://152.136.59.62:8000/linktype/linkNo?attribute=?`

attribute: usually as ‘number’ – event No

In this way we separated our front and back-end development by data transmission. I could enquire the data that I need through simple URL request in the method of post and will not frustrated each other’s development speed.

3.2.2 Source Layer

Source Layer is the main package of our project. It includes router layer which regulates the direction and structure of all the pages in view layer.

Utils consist most of the data requests and interfaces to back-end system that packaged in this API folder. Also, it includes some verification processes in Utils like providing the access-Token, recording the error-log, verifying the permission, etc.

View layer [Fig.9] consists of all the pages of this project. All of the pages are arranged in the document type of VUE, and this layer could be considered as the presentation layer. From the user’s perspective, they jump from one page to another page in view layer and this establish the main structure of our system’s logic.

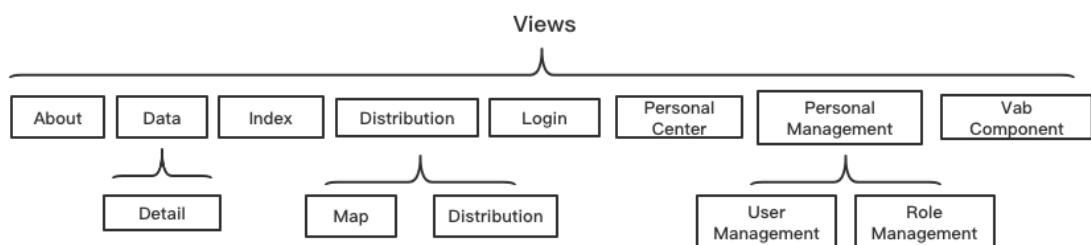


Figure 9 Pages presentation in View Layer

In source layer we also include some general settings and configuration [Fig.10] for this project. Including images and pictures in assets, some colorful icons, different themes selection. We also arranged some custom plugins and wrote some introduce statement for import and calling.

In config folder, permission of different role of this system is verified and two kinds of routing patterns called ‘all’ and ‘intelligence’ are stipulated. In the ‘setting’ part, we could manual open/close some settings based on true or false option and simply custom some important parameters like ‘dev-Port’, ‘skeleton’, ‘layout’, etc.

Component part is used for format rendering such as side bars or some skeletons that with fixed frame. If we want to reach the same effect in different pages, component render is recommended, and we don’t need to write the same code for multiple times.

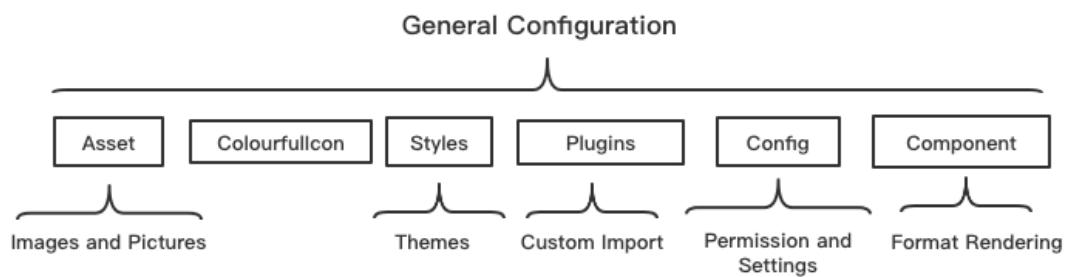


Figure 10 General configuration in Source Layer

3.2.3 Public & Config Layer

This layer is mainly designed for some external plugins or IDE configuration. Some commonly used tool configuration is defined globally such as ‘WebStorm’ (Although we adopted Visual Studio Code as our IDE), ‘ESlint’, etc.

Some significant system file is also regulated in this part such as ‘config’, ‘deploy’, ‘LICENSE’, ‘README’, ‘Security’, etc.

3.3 Pages Implementation

3.3.1 Index Page

Index page concludes all the statistical information that we have obtained and calculated. It serves as the director and starter of our system. We emphasize two parameters ‘total earthquake events’ and ‘total social media content’ to manifest our great strength in data management through our model and compelling statistical background.

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We also calculate the amount of earthquake in each month in the form of line chart as time goes by, and also the corresponding opinion number in China. Each earthquake has a magnitude, so we define magnitude as an important parameter which express the severity of each event. We recorded all the earthquake magnitude and classified in the form of pie charts.

We also provide hierarchical buttons toward same-level or subpages like ‘earthquake event’, ‘detail event information’, ‘public opinion’ and ‘earthquake distribution’.



Figure 11 Index Statistical data

In this aspect, we also conduct several average values for contrasting and general explanation. Users are able to have a probable estimate of overall data and information about earthquake that happening all over China. Also, they are able to figure out the exact month or events that stand uniquely. Month average earthquake and opinions is calculated through equation (1) and (2). Average magnitude is calculated through equation (3). We believe we have obtained convincing information accuracy after such great amount of data is analysed and classified.

$$Earthquake_{(Average)} = (\sum_{i=1}^n Event / months) \quad (1)$$

$$Opinion_{(Average)} = (\sum_{i=1}^n Opinion / months) \quad (2)$$

$$Magnitude_{(Average)} = (E_1 * 6 + E_2 * 4.5 + E_3 * 3 + E_4 * 1) / \sum_{i=1}^4 E_i \quad (3)$$

E_1 : strong earthquake, E_2 : middle earthquake, E_3 : felt earthquake, E_4 : weak earthquake

We also exhibit two China Maps for exhibiting the general distribution situation according to our data [Fig. 12]. ‘Earthquake Distribution Map’ calculates all the earthquake events in each region and label the area in different colours. ‘Opinion Distribution Map’ defines the relevant opinion message that we crawled in each region. We open the tooltip bar for colour tip in both maps, which indicates that the warmer the colour is, the more data is counted in this region.

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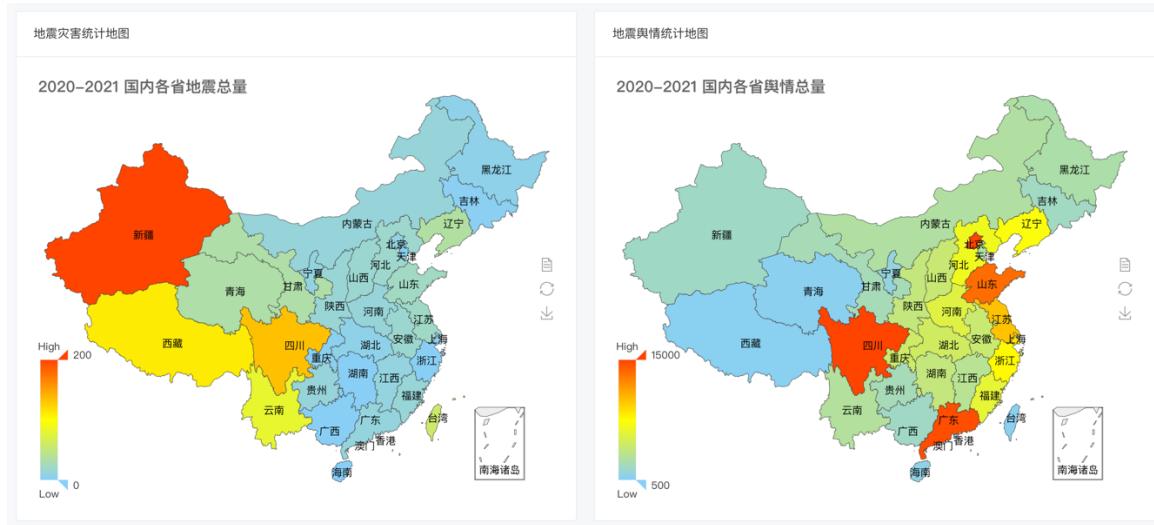


Figure 12 Data Distribution on China Map

For all the charts in index page, we open up the tooltip for floating prompt. User could easily glance at the exact number or information when their mouse moving in.

3.3.2 Earthquake Event Page

Earthquake event page demonstrate a data list for all the earthquake message that we have collected and defined as an ‘event’ [Fig. 13]. We classified all those events into different region in China and label those regions in different colours. User could easily find out the regulation area of those region (Baidu Zhidao, seven regions) through Baidu or Google.

可信度	市级地区	县级地区	地区	时间	事件简介
高可信度	玉树藏族自治州	治多县	青海省	2021-03-27 14:43:00	3.2级地震,震源深度10千米
高可信度	阿克苏地区	沙雅县	新疆维吾尔自治区	2021-03-27 07:11:00	4.7级左右地震
高可信度	山南市	错那县	西藏自治区	2021-03-27 03:05:00	4.8级左右地震
高可信度	塔城地区	乌苏市	新疆维吾尔自治区	2021-03-26 09:37:00	3.1级地震,震源深度9千米
高可信度	玉树藏族自治州	治多县	青海省	2021-03-26 08:27:00	4.0级地震,震源深度10千米
高可信度	顺义区		北京市	2021-03-25 01:01:00	2.3级地震,震源深度10千米
高可信度	西安市	周至县	陕西省	2021-03-24 10:30:00	1.6级地震,震源深度10千米
高可信度	阿克苏地区	拜城县	新疆维吾尔自治区	2021-03-24 08:13:00	3.4级地震,震源深度11千米
高可信度	阿克苏地区	拜城县	新疆维吾尔自治区	2021-03-24 05:27:00	5.4级地震,震源深度10千米

Figure 13 The Data Table for Earthquake Event

Through clicking the corresponding buttons on top left corner, the platform will automatically manage the Array list and pagination of this data table, then exhibiting the earthquake events that happened in this region [Fig.14].



Figure 14 Region Selection

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In this data table, I arrange each column in reasonable width so as to meet the most comfortable appearance. We concluded all of our data message and formatted them into seven columns: ‘credibility’, ‘city’, ‘area’, ‘region’, ‘time’ and ‘simple description’. Due to our model’s weakness or lack of sufficient data about certain event, we could not establish the exact ‘area’ or ‘city’ of certain events and define them as missed.

Especially, ‘reliability’ stands for the credibility or authenticity of certain event [Fig.15], since sometimes we could not truly verify some event with poor evidence only in Weibo message. We define those events which obtain small quantity of data to be ‘low-credibility’. In this case, the description of those event will indicate their low possibility or simple ‘around’.

Figure 15 Credibility and Query Form

For convenience of our user, I design and implemented the credibility selection button and a query form based on this data table. The system will exhibit the corresponding information with the attribute ‘credibility’ after the selection. Meanwhile, if the user needs to explore or check the earthquake events in decided location, he could query the string in query form and receive a reasonable consequence. This query form supports fuzzy word or single word in attribute ‘region’.

Each simple description is a redirection link to the event’s detail Weibo Information. It will lead you to the ‘Detail page’ for Statistical information exhibition.

3.3.3 Detail Information Page

3.2.3.1 Heat theme river

Detail information page is designed to exhibit all the detail information and statistical data that recorded and analysis by us. The event-based idea is deployed into this single page with multiple components exhibiting in both macroscopical and microscopical. Each ‘event’ will obtain its own expression and content in this format.

The theme river [Fig.16] is designed for showing the heat of this ‘event’ as time goes by. As I have mentioned in the Background Part, this chart could be adopted to demonstrate the trend or tendency of one theme that extracted from social media disaster. The higher or wider the river is on some date, the more popular or intense this earthquake is discussed.

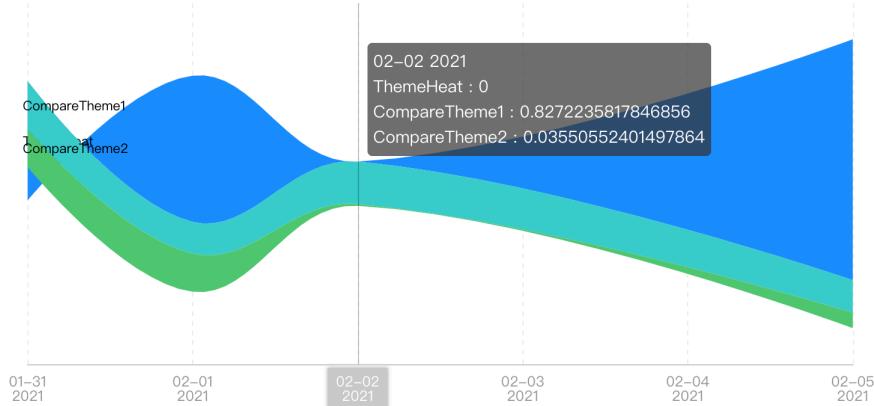


Figure 16 Heat Theme River with Compared parameter
CompareTheme1 & CompareTheme2: Contrasting Variables

We regulated the Heat parameter X to between 1 and 0. The theme river chart will accept X and construct wave according to our x axis of date and y axis of heat.

$$X = 0.4 \ln(x_1 + 1) + 0.4 \ln(x_2 + 1) + 0.2 \ln(x_3 + 1) \quad (4)$$

X: heat parameter, x_1 : forward number, x_2 : comment number, x_3 : like number

I also deploy two parameters ‘CompareTheme-1’ and ‘CompareTheme-2’ for contrast and achieve better charts manifestation. Those two parameters are automatically created in the same date through JS method ‘Math.random()’.

For better user experience and more humanized function settings, we open up the floating tooltip for this chart. When user’s mouse is perpendicular to exact x axis of date in this chart, both time information and parameters with values will show up in a floating card.

3.2.3.2 Word Clouds

Word clouds is another important measurement index for earthquake events. We deploy two kinds of word cloud for exhibition: heat cloud and topic cloud.

As the background has mentioned, word clouds list a series of words on a plane and stipulate that the bigger the word is, the more frequent the word will show up. In this case, we are able to fetch the most relevant and referential information to this event, based on the key words that Weibo users searched or discussed.

Heat cloud [Fig.17] is designed for displaying the most popular and relevant ‘words’ of this event. For distinction, we adopted different colours for adjacent words so that users will not mix words with similar appearance and have a better viewing experience. Crucial words will tend to gather in the centre of this card and appear in bigger shape.

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Figure 17 Heat Cloud for Words

Topic cloud [Fig.18] is designed for those popular topic and high-frequency verses. Rather than simple 2-3 words, topic cloud is able to define the event more well-meaning and even deliver emotion imperceptibly. Usually, some topic might also demonstrate important attributes and geographic information by the way.

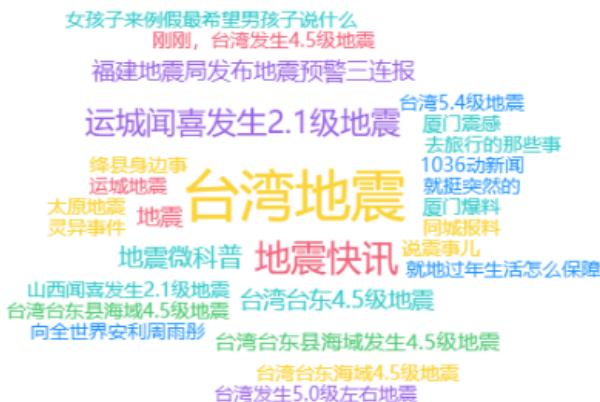


Figure 18 Heat Cloud for Topics

We design both the words and topic in heat cloud to be clickable. For humanized thoughts, since some user might intend to explore the relevant information in Weibo, so we designed the words in heat cloud card to be query form to search information with selected key words [Fig.19]. After clicking at one element, our user will be able to glance over in source platform with high credibility.



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Figure 19 Redirection and Selected word Inquire

3.2.3.3 Statistical Calculation

We arranged this page for exhibiting the pie charts and data comparison [Fig.20]. We conclude some vital index for each event, and classified them into different categories, which will show their value in the process of contrast.

- We record ‘forward number’, ‘media number’, ‘original Weibo number’ for the contrast of general information for this event’s characteristics.
- ‘total news number’ and ‘total Weibo number’ forms another pie to demonstrate the statistical information about both two categories of social media.
- We also calculated the user certification information. We believe that a certificated user is more likely to post veritable and original Weibo information in their perspective. Therefore, we arranged a contrast between normal and certificated users.

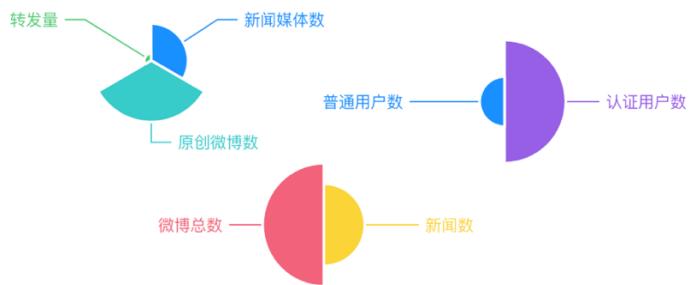


Figure 20 Pie Charts for Data Contrast

We also open up the data tooltips for humanized user experience. Once their mouse enters a part of a pie, then corresponding category names and data will show up. Users could also select or neglect parts of the categories by choosing the legend [Fig.21], and the charts will dynamically change its angle in selected situation.



Figure 21 Legend Selection

3.2.3.4 Data Distribution on Map

This part is quite the same as the China map in Index page. However, this map concludes the data that we recorded only for this ‘event’ rather than overall data. In other words, we start off in a more microscopic point of view to analyse that people in which place will discuss about this ‘event’ fervently.

Therefore, this map will indicate how many articles of Weibo or News that are closely relevant to this ‘event’ and we describe them to be clauses [Fig.22]. Similarly, we open up the tooltips and article count for interval distribution, and the area selected or entered with mouse will be changed its colour into yellow and highlighted.



Figure 1 Distribution Map for Single ‘event’

3.2.3.5 Knowledge Map

In the library and information industry, knowledge map is called the knowledge visualization or knowledge mapping map, which conducts a series of different graphs showing the relationship between the development process and the structure of knowledge. It applies visualization technology to describe knowledge resources and their carriers, mining, analysing, constructing, drawing, displaying knowledge and the mutual relations between them.

Usually, the map starts from one single point and derive its attributes or relationships into adjacent node. By extending and storing, a map graph is constituted.

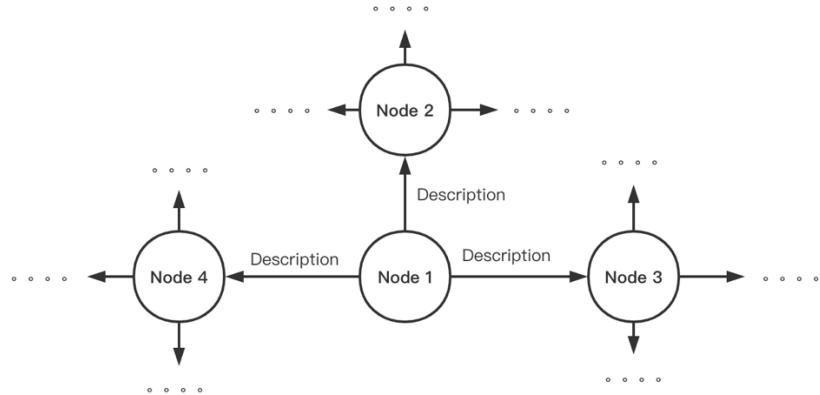


Figure 23 Knowledge Map Description

In our knowledge graph, we usually use ‘entity’ to represent the nodes in the graph and ‘relation’ to on behalf of the edge. Entities refer to things in the real world, such as people, place names, concepts, drugs, companies, etc (Here we consider of those entities to be ‘attributes’). while relationships are used to express some kind of connection between different entities.

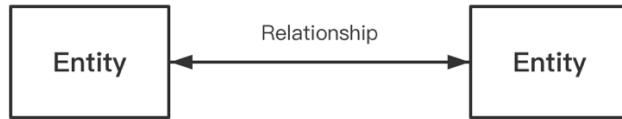


Figure 24 Entity (node) and Relationship (edge)

We adopted the basic form and construction of knowledge map here to exhibit the general data attributes of this ‘event’. Through this simple form of knowledge map, users could not only obtain significant information like ‘magnitude’, ‘location’, ‘time’, ‘length’, but also human factor like ‘human perception’, ‘popular words’, ‘longitude’, ‘latitude’, ‘casualty’, etc.

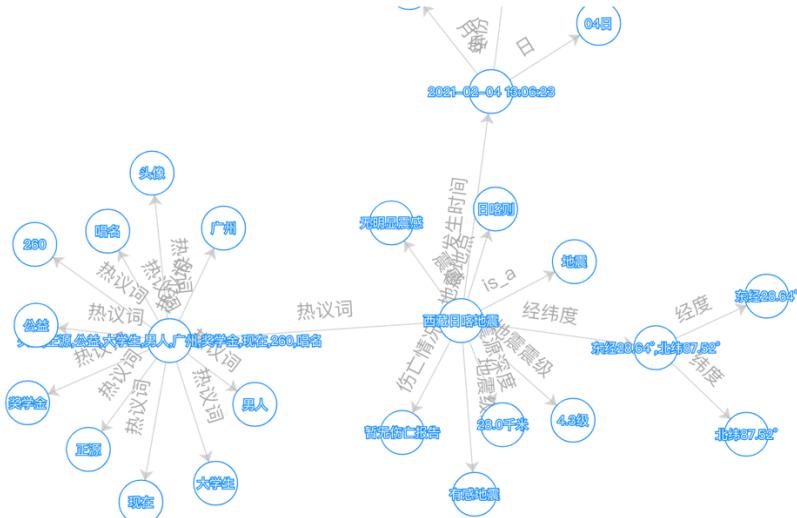


Figure 25 Knowledge map for each ‘event’

This knowledge map could be dragged and move dynamically. This elastic effect will provide user with better experience and flexibility when they want to review certain branches in the middle of card. Moreover, users are able to zoom in or out as their wishes to obtain a more full-scale view of the map.

3.2.3.6 Time/Event Line

Event line is a very important part in the system, which connect all the relevant ‘events’ in one line based on chronological order. Through event line, users are able to have a general command of all the events happened in this place. Similarly, event line contains all the significant attributes that describing the event independently [Fig.26], including ‘province’, ‘city’, ‘area’, ‘time’, ‘magnitude’ and ‘focal depth’.

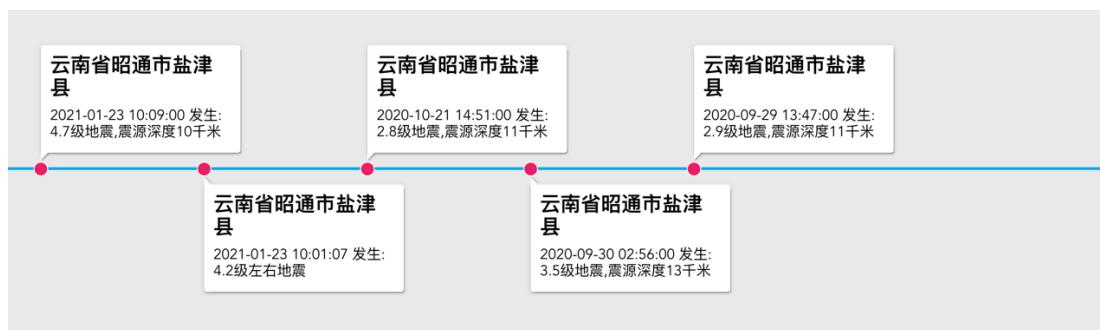


Figure 26 An example of event line

Those events (cards) in the event line are clickable for re-search [Fig.27] the data or information in detail page. After noticing and considering the great challenge in connecting information and page consistency, we believe that the event line is the best choice to provide users with great

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flexibility and convenience to skip to different events. The system will request the corresponding information of every components related to that events

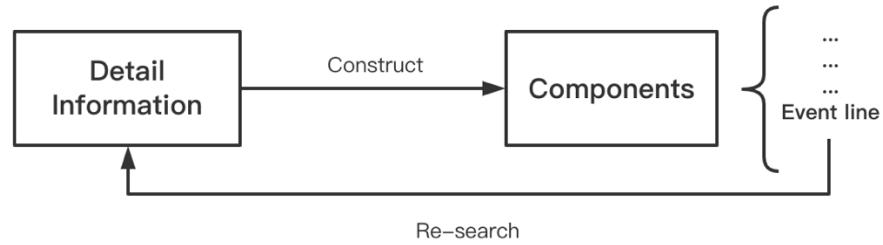


Figure 27 Data Re-search based on Event Line Selection

3.2.3.7 Source Data

We deploy a list showing the message and data that fetched from Weibo or News and describe them as ‘source data’. We adopt conditional rendering to the list for both kind of social media information. With selection button of ‘data source’, users could determine which kind of data to show in this list.

Source data from Weibo [Fig.28] will consist of attributes like ‘date’, ‘comment number’, ‘forward number’, ‘like number’, ‘username’ and ‘source information’. This sort of data is mainly constituted from personal users, which contains high sentimental value of human emotion and subjective tendency. However, they might not be accurate.



Figure 28 Source data from Weibo Personal User

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Source data from News are fetched and analysed from certificated or official media with high credibility. We extracted the information of their ‘date’, ‘media name’, ‘title’ and ‘sketch’ to build the recapitulative list briefly.



Figure 29 Source data from certificated or Official News Media

For both of the source data lists, each card is a redirection URL link, which opens a new blank window to the original message. In this aspect, we prove our data authenticity and foundation and also provide our users with a better way to explore the events.

临沧市永德县附近发生4.0级左右地震

2021年01月17日 13:00 新浪网 作者 春城晚报

A⁻ A⁺



#云南发布# 【临沧市永德县附近发生4.0级左右地震】中国地震台网自动测定：01月17日12时44分在云南临沧市永德县附近（北纬24.32度，东经99.35度）发生4.0级左右地震，最终结果以正式速报为准。 <http://t.cn/A65ZmW7o>



Figure 30 New window redirection to News source data

3.3.4 Latest Opinion Page

Latest Opinion page defines the ‘Latest Weibo Opinion’ and ‘latest News Opinion’, which are recorded and estimated through our model to list out both the latest 1000 relevant articles. Category of data is updated in real time so long as our machine at work.

In the latest Weibo opinion part [Fig. 31], we not only stipulated basic information ‘username’, ‘relevance’ and ‘post-date’, but also introduce several significant propensity attributes like ‘comments number’, ‘forward number’, ‘like number’. Through those three measured parameters, we and users are able to distinguish message that worthy for reference and have popular evaluation.

用户信息	相关程度	发表日期	评论数	转发数	点赞数	事件简介
流亡树莓	相关	2021-03-28 23:58:00	0	0	0	我心碎了西八.他是不会说出来的.这么多年来不论是受伤还是哮喘.他都是默默承受着到比赛结束....
贵州共青团	相关	2021-03-28 23:50:00	0	0	1	贵州消防地震救援实战演练来袭【直播预告】！三天两夜不断播，挑战史上直播时间最长的一次！...
毒嘴小姐姐	相关	2021-03-28 23:47:00	0	0	0	励志，长大后我就成了你！汶川地震想当空降兵的小男孩，不但真的当了兵，还要上阅兵场！
给钱谢谢o	相关	2021-03-28 23:45:00	5	0	0	经历过大半夜石油勘测吗，哪怕我一个经历了512汶川大地震每月一大震每回一小震的四川人都被...
不想努力了的阿泽x	相关	2021-03-28 23:44:00	0	0	0	最近又是大雨又是地震的总感觉要来点大事情
皇家地理学会	相关	2021-03-28 23:43:00	8	4	18	直升机这个东西用处真的很大。中国地广辽阔，地形地貌多样化，应该大力发展直升机产业。2008...
安顺消防	相关	2021-03-28 23:43:00	3	1	1	贵州消防地震救援实战演练来袭公告广大市民：为提高全省消防救援队伍区域应急救援实战...

Figure 31 Latest Weibo Opinion

Latest News Opinion [Fig.32] defines those information and message from certified news media such as SINA News, official Seismic channel or high reliability platforms, rather than personal individual Weibo. News media category provides more reliable and valuable information that deserves study. We list out the ‘platform names’, ‘relevance’, ‘post-date’ as Weibo opinion part does. Especially, ‘title’ is be of great importance to have a general glance over news and this is why we choose to reserve a column for it.

用户信息	相关程度	发表日期	标题	事件简介
央视	相关	2021-03-28 13:26:00	西藏那曲市比如县发生3.0级地震 震源深度10千米	原标题：西藏那曲市比如县发生3.0级地震,震源深度10千米,来源： 3月28日13时7分在西藏那曲市比如...
中国地震台网速报	相关	2021-03-28 13:21:34	西藏那曲市比如县发生3.0级地震	3月28日13时7分在西藏那曲市比如县发生3.0级地震,震源深度10千米,震中位于北纬31.93度,东经...
中国地震台网速报	相关	2021-03-28 13:21:30	地震快讯	#地震快讯#03月28日13时07分在西藏那曲市比如县(北纬31.93度,东经92.86度)发生3.0级地震,...
电网头条	相关	2021-03-28 13:11:05	新疆阿克苏地区库车市发生3.0级地震,	原标题：新疆阿克苏地区库车市发生3.0级地震, 3月28日12时32分在新疆阿克苏地区库车市发生3.0...
沈阳晚报	相关	2021-03-28 13:02:50	辽宁这里连续发生地震，省地震局这么说.....	原标题：辽宁这里连续发生地震，省地震局这么说..... 3月26日21:24，辽宁省地震局官方微博发布信...
新浪财经	相关	2021-03-28 12:47:11	3月28日12时32分在新疆阿克苏地区库车市发生3...	3月28日12时32分在新疆阿克苏地区库车市发生3.0级地震,震源深度10千米
界面新闻	相关	2021-03-28 12:47:00	新疆阿克苏地区库车市发生3.0级地震	原标题：新疆阿克苏地区库车市发生3.0级地震 据微博消息, 3月28日12时32分在新疆阿克苏地区...

Figure 32 Latest News Opinion

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In order to prove our data's authenticity and provides handy reach for those users who wants to access original message, the 'event description' in both opinion parts serves as a link bringing user to Weibo and skip to that original resource.

We also employ humanized relevance selection choice for user. They have the capacity to choose which kind of information they will scan centrally. Moreover, we open the preview card tooltip for description link for those users whose browser interface is too small and could not have an overall view of the description.

3.3.5 Earthquake Distribution Page

In some situation, it is of high value for developer to deploy a macroscopical map tools for their users. Therefore, I have arranged this earthquake distribution page to label all the recent earthquake events that happened in China.

I selected the MapTalks & Baidu for general map layer in dark blue [Fig.33]. It is flexible and light with super-fast rendering speed. User could easily zoom in or out by sliding their rollers to get a more pleasing view. We set the initial zoom of map layer to be 1.2 and make sure that our user will have an overall view of China at first.



Figure 33 Map & Marker location

Each marker from MapTalks is associated with one single event. The marker conducts four types of actions:

- The information card will automatically show up when user's mouse enters a marker.
- The information card will automatically disappear when user's mouse leaves the marker.
- User will jump to the location detail page after clicking at the marker.

- User's angle of view will self-adapted to the marker's position when his/her mouse enters a marker.
- The system will record the events that user has glanced.

The card panel example [Fig.34] consists of several information, including 'province', 'city', 'area', 'time', 'magnitude' and more representative 'focal depth'. For the sake of giving prominence to the key points of our events' relevance and event-based analysis methods, we also arranged the number former of events happened in this location. Through this attribute, users are able to have a perceive about whether earthquake happens in this place in high or low frequency (prone area).



Figure 34 The example of Event Card

3.3.6 Location Event Line

After clicking the marker of certain event, the system will direct you to a page of event-line [Fig. 35] consisting of all the recent/former earthquakes happened in this place. The information in this page is quite the same as location marker, with 'Region', 'city', 'area', 'magnitude', 'focal depth' and 'date'. The length of this event-line is identical to the number of former events.



Figure 35 Event-line for Former Earthquakes

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And we also provide the ‘credibility’ selection and location query form here. User could select the events with high or low credibility and thus browse the events according to their own ideas. The query form will also recombine the data list and exhibit according to input key words. However, this time the query form will dispose attribute ‘area’ rather than ‘region’.

Figure 36 Credibility Selection and Query Form

Each card in event-line is an independent page redirection to Weibo detail page. In this case, we achieved the goal of gathering information and data into events and form a closed loop circuit on our website. Again, users are able to experience our thought of event-based implementation.

3.3.7 Documentation Page

The documentation page will help user better understand our system’s functionalities and logical structure. Users could either jump from index button ‘about’ or from router tree. It mostly consists of static information and formatted log written in advance which does not require frequent data updates.

We provide a link to our system file and documentation on GitHub [Fig.37]. In our GitHub document, as I have mentioned above, will give more specific explanations to our URL settings and parameters implications.

 GitHub 基于社交媒体的灾害分析系统。在这里，你可以获得最新的、实时的、分析处理过的多样数据信息。 (链接至系统文档)

Figure 37 Link to GitHub System File

The main part of our documentation page is a long passage about our system’s function and parameters’ meaning. It is highly formative and supports various text formats as a ‘make up’ language.

In this part, as most of the online system would be, we explain to our user hand by hand and give them each parameter’s implication as well as principles. We also tell them why we set the parameters in this way and why they are classified into relevant categories.

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| 地震地点 - 事件线 |

- 事件线 - 事件线是我们系统重要的一个功能，它列举出了该地点在历史上有关的地震信息/灾害信息，并记录了其相关的时间，从左到右，远到近，制作成了事件线
- 事件线 - 地点 - 事件线的地点包括 省份、 地级市、 县级区域
- 事件线 - 时间 - 事件线的时间包括了 年份、 月份、 日期
- 事件线 - 摘要 - 事件线摘要将包括该次事件的某些简略信息，例如地震则简要阐述了震级
- <点击> - 每个 事件 卡片均可点击，点击对应卡片将在本<微博详情>页面 重新检索 有关于该事件的相关信息，重新整理数据并做相应的展示
- <滑动> - 当事件数量超过了 事件线 卡片的页面宽度，将会自适应出现拖动滑块

| 数据列表信息展示 |

- 数据来源 - 微博 - 以列表形式展示了所有有关于该次事件的 Weibo 数据，若要展示该数据，可点击该卡片左上方的 绿色按钮
- 数据来源 - 新闻 - 以列表形式展示了所有有关于该次事件的 新闻 数据，若要展示该数据，可点击左上方的 红色按钮
- 数据 - 相关性

| 相关程度: 相关 | 相关程度: 不相关 |

| ----- | ----- |

| 组件 - 绿色 | 组件 - 红色 |

- Weibo - 微博主要记录了其 相关程度、 发表时间、 评论数、 转发量、 点赞量 四个重要指标，后续将对数据做更好的突出，比如点赞量超过 30 将会对消息进行认证/突出
- 新闻 - 新闻主要记录了包括 相关程度、 媒体名称+类型、 新闻标题，以及对应的 新闻内容 在内的多个指标
- <点击> - 每个 Weibo 和 新闻 的内容均为外链链接，通过点击可以跳转至微博 app，并浏览其原生内容，以证明我们数据的可靠性和稳定性来源。

Figure 38 Document for System Explanation

We adopted JsDelivr for this ‘make up script’ document which could be visit in our ‘Resource’ repository on GitHub. In this case, it is more convenient for us to make adjustment to this document in text form without deploying or uploading to the sever.

We also deployed a sunburst visual map for system’s logic description. Through simple click, users are able to dynamically comprehend among pages and their hierarchical structure.

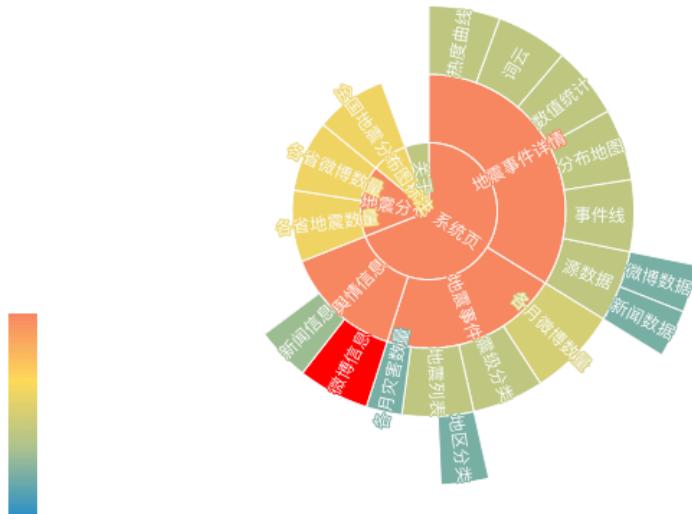


Figure 39 Sunburst Visual Map for System’s Logic

System’s decencies and version information are also included in this page. Although they are not really useful to our users to some extent, but we still put it here for better page integrity and performance.

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系统依赖信息		部署时间:2021-4-16 09:54:15	
@vue/cli版本	^4.5.6	vue版本	^2.6.12
vuex版本	^3.5.1	vue-router版本	^3.4.3
element-ui版本	^2.13.2	axios版本	^0.20.0
eslint版本	^7.9.0	prettier版本	^2.1.2
sass版本	^1.26.10	mockjs版本	
zx-layouts版本	^0.6.13	lodash版本	^4.17.20

Figure 40 Dependencies and Versions Information

We also arranged a vertical timeline here for functional updates or adjustment. It is not to formally or elaborately demonstrating all of our work, but briefly introduce the representational stuff that deserved recording.

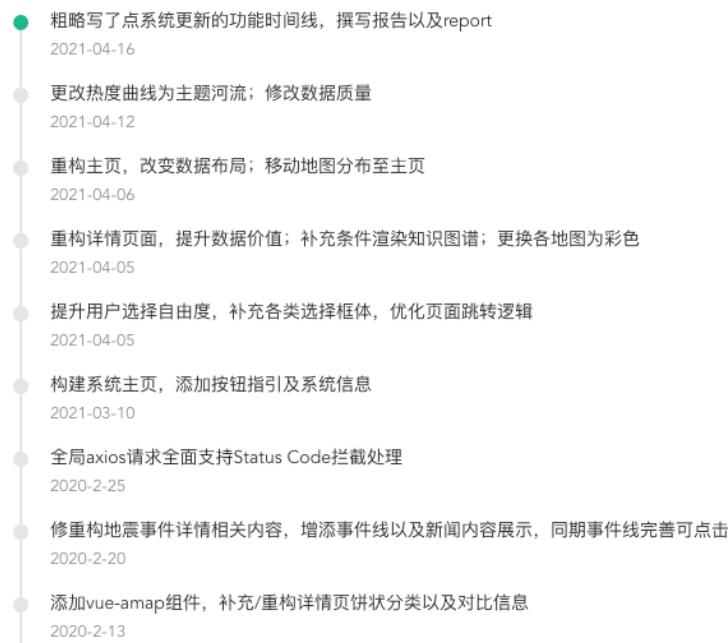


Figure 41 Timeline for Crucial Updates or Adjustment

3.3.8 User/Role Management Page

User management page and role management page are designed for humanized use from the perspective of a real system on the market. Actually, we don't involve any data transmission to our database for ‘user management’ part because it will bring tremendous workload to our back-end developer but little use. Moreover, it is out of my working scope or project description.

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For the sake of convenience, we only implement several interfaces or connectors in those pages and show our aspiration to manage our users' accounts.

For user information management page, administrator or tester of this system is able to handle the user information directly with administration operations.

电话	用户名	邮箱	权限	修改时间	操作
13001137866	admin	1298508511@qq.com	admin	2021-03-16 07:46:55	编辑 删除
13001137866	editor	2017212938@bupt.edu.cn	editor	2021-03-19 07:46:55	编辑 删除
13001137866	ljq2263	2017212938@bupt.edu.cn	admin editor	2021-03-21 07:46:55	编辑 删除

共 3 条 10条/页 < > 前往 1 页

Figure 42 User Information Management

As we have supposed, administrator is able to 'add' or 'delete' the users in batch form or singly. Also, if the administrator wants to enquire the specific user's name, he could fill in the enquire form and search for the result.

The user information column contains attributes like 'phone', 'username', 'mail address', 'account type', 'active date' and also adjustment operations. When clicking at the 'modification' button, a simulative information adjustment form will appear.

编辑

* 用户名: admin

* 密码: *****

* 邮箱: 1298508511@qq.com

* 权限: admin editor

取消 确定

Figure 43 Information Adjustment Form

With this adjustment form, administrator is able to change the 'username', 'password', 'email', and 'jurisdiction' accordingly, which is simulated and alerted only in our front-end system. Those functions demonstrate our mind of system operation and maintenance, which could be realized in the future if we have time.

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For user information management, we also deploy role management for ‘administrator’, ‘editor’ or ‘tester’, which is designed for changing the access code of different role. The data table also includes ‘add’ or ‘delete’ functions and the query form for searching.

操作	
编辑	删除
编辑	删除
编辑	删除

Figure 44 Role Management

3.3.9 User Login

User login serves as a necessary function in our system. However, user login will not actually involve any data transmission with our database or backend system but only receive prescribed and static data from the Mock layer.

If we decide to connect the database, it will bring about tremendous workload to my back-end teammate but little utility, which is not my working or display scope either. In addition, there are not so many B end users in our system demanding the function of actual user information record.

From the perspective of rapid development and efficiency, we decide to verify the user’s account only by front end simulative data, and our logic picture is defined as below.

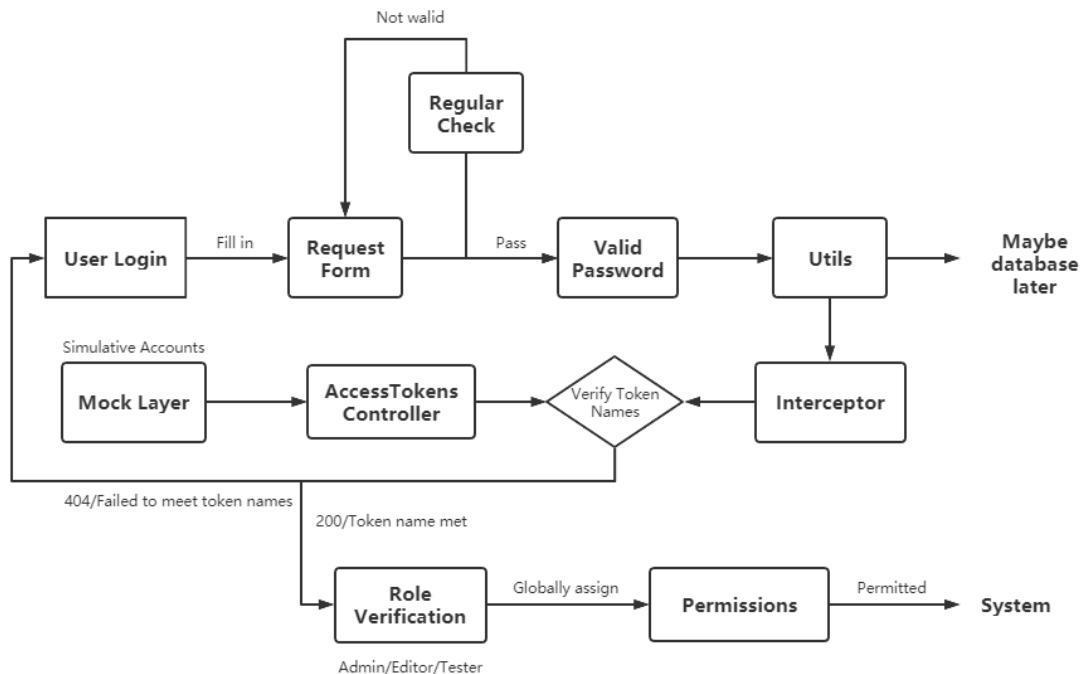


Figure 45 Login Management Logic and Verification

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In login page, the user will submit both his username and password in a request form. The request form will first be verified with regular check to decide whether it is a legitimate ‘Password’ first, for example, its length should higher than 6 digits and it could not include any spaces or direction keys, etc.

Then the valid password will be passed to the util interfaces for delivery, where the interceptor holds up the form instead of connecting with the back-end system. Meanwhile, our mock layer will produce the account information with regulated ‘Access-Token’ for each user (The back end should produce similar information format in database environment).

```
const accessTokens = {  
    //添加用户以及对应权限的位置: 添加新用户  
    admin: "admin-accessToken",  
    editor: "editor-accessToken",  
    test: "test-accessToken",  
    lJx02263: "test-accessToken",  
};
```

Figure 46 Mock Accounts Providing Different Access-Tokens

In permission controller, token names will be checked. If the names fail to match, the system will automatically direct back to the login page. On the contrary, if the token names meet, the request will be passed to role verification and globally assigned corresponding identity in the system.

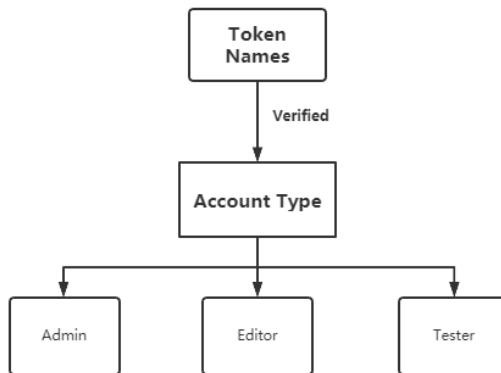


Figure 47 Role Selection

In this case, we verify our accounts and users only through our front-end Mock layer and we are in high confident to deploy it with actual database and back-end controllers in the near future.

3.3.10 User Information Page

We also adopt user information page for simulative exhibition. After the user login and click at the user information button, he will be directed into a page showing the basic information of his account. Actually, writing all user information into database and providing interfaces to update, read or write would lead to tremendous amount of work we don't need by now. In this case, we only display a static page for ‘simulative’ information which is fixed in our front-end system.

Liao Jianxiang
富在术数，不在劳身；利在势居，不在力耕。
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基本信息 账号绑定

姓名 Liao Jianxiang
昵称 便利店
性别 男
个人简介 富在术数，不在劳身；利在势居，不在力耕。
保存

前端开发 2021/4/12 男 国际学院 - 17级 - 电子商务与法律 中国 • 北京市 • 北京邮电大学 技术：JavaScript、HTML、CSS、Vue、Node

个性标签 个性 性格 双鱼座 努力学习 没写完

Figure 48 User Information and Mock Form

If the user changes the text in personal description, the label under user's name will change as well. We also deployed the button ‘Save’ for simulative saving and also ‘Follow me’ for simulative following. Those buttons and functions do not involve any data transmission to back end system but construct interfaces and system like scale for later updates if possible.

Chapter 4: Results and Discussion

4.1 White-box Testing

White-box testing is also known as structured testing or logic-driven testing. It is also called the test case design approach. The ‘box’ refers to the software being tested, whose logical structure and internal settings are fully visible to the tester.

In using this scheme, the tester must examine the internal structure of the program and derive test data from the logic of the program, which is also understood as exhaustive path testing.

In our system, I tested every branch and jump and record of their respond and constitute a flow diagram as the figure below.

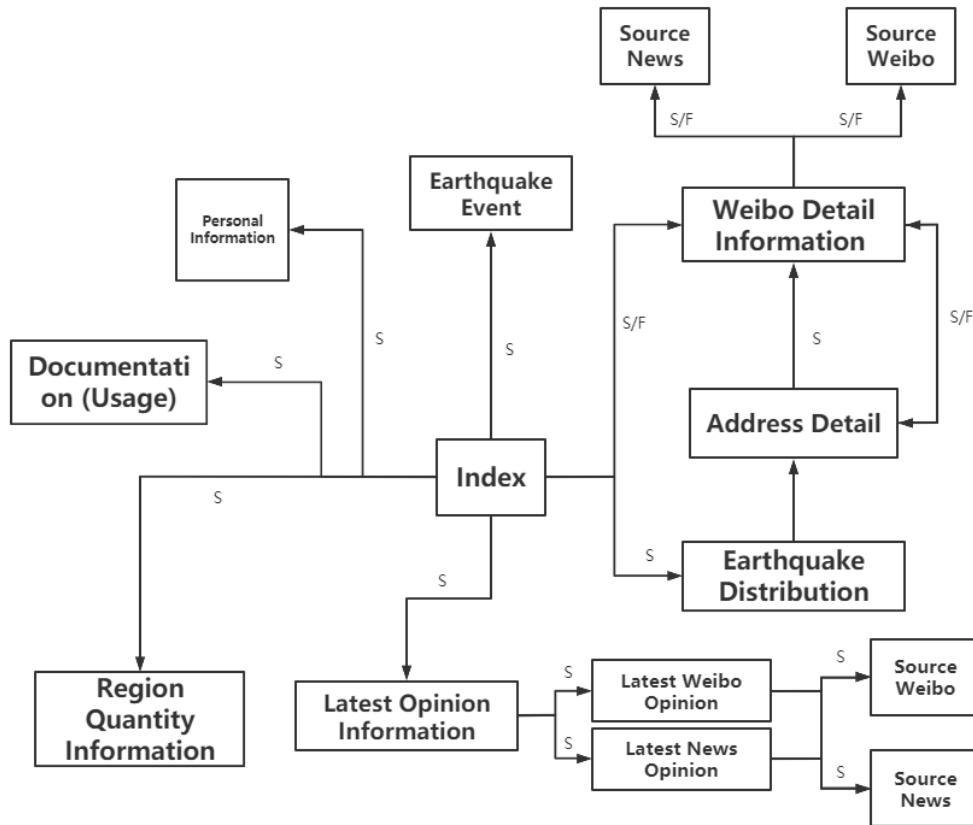


Figure 49 White box Testing for Page logic

S: Success, **F:** Fail, **S/F:** sometimes S and sometimes F

We could conclude from our result that nearly all of the branches that we tested passed successfully. The ‘S’ stands for success and ‘F’ stands for Fail. There is no failure in our system but only ‘S/F’ for sometimes success and sometimes failure.

Website for Natural Disaster Monitoring based on multiple social media

As we have regulated, users could jump to Weibo detail information page from index and the system will automatically display the latest event information. Since the information and mining time for latest event might be limited or too short, page components might not work well in this situation, which is hard to balance with other events.

As the same case, when users jump from Address detail to Weibo detail page, some event in timeline might not obtain sufficient data information. Thus, some components might load with data distortion.

When redirecting to the source Weibo or News, users sometimes meet with failure because the original message may have already been taken down or deleted.

4.2 Black-box Testing

Black box testing, which is a test to see if each function is working properly without understanding the internal logic of the system or software. Different from white-box testing, the tester will not know the internal logic of the system and only test the system with his own personal experience.

Black box testing focuses on the external structure of the program, regardless of the internal logic structure, and mainly tests the interface and function of the software.

I invited one of my roommates to experience our system functions without introducing any code structure or implementation. In his opinion, our functions almost meet his requirements and do not have severe defects or bugs. If we could extend our media types or disaster types to become more multi-various, users will be amazed, and the system will become more fulfilling.

4.3 Pressure Test

Pressure test is to pressure the software constantly by forcing under the condition of the limit of its operation. Through the test program at the same time or within a certain period of time, the system sends the expected number of trade request to find out the efficiency under different pressure conditions. Then we could find out how much pressure the system can withstand.

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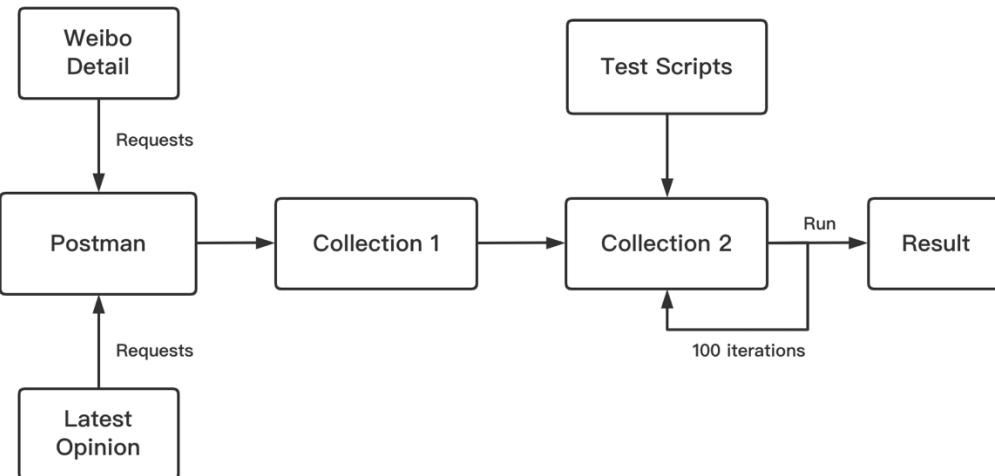


Figure 50 Pressure Test Procedures with Postman

We adopted ‘postman’ to conduct simple pressure test on our server-side interface. We set all the requests from Weibo Detail page and Latest opinion page in a collection. In each request, we set the method to ‘post’ and regulate the following test scripts.



Figure 51 Test Scripts for Each Request

We want the respond code to be ‘200’ successful, and the respond time to be less than 1000ms. Also, we assigned the data we received into JSON format if it is successfully delivered. Then we run our collection with 100 iterations (not so many users or little pressure of sever up to now) and no delay, and the result is exhibited in the following pictures [Fig 45&46].

We could conclude that our interface possesses great performance since only 2 tests fail because of exceeding the respond time, which might cause some inessential delay. The rest 1798 test cases all succeed as our expectation.

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Figure 52 General Test Summary

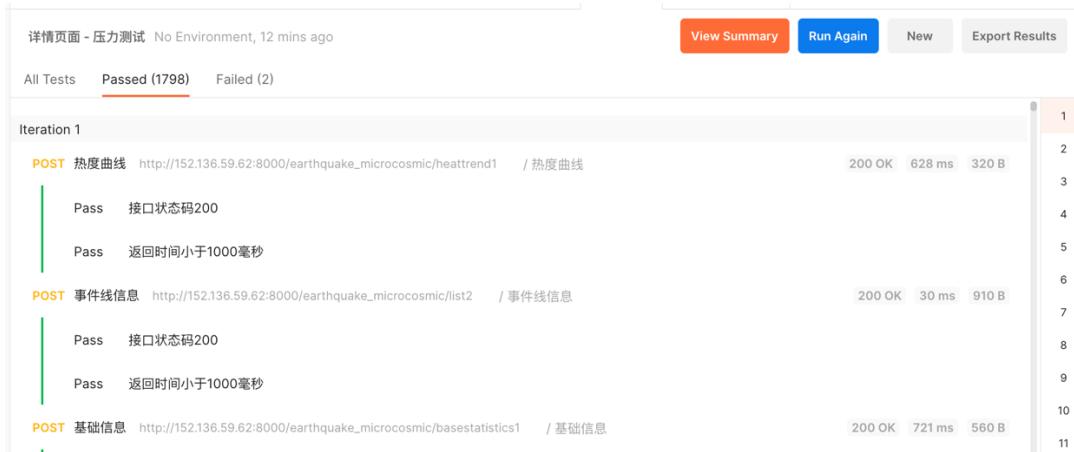


Figure 53 Test result

Chapter 5: Conclusion and Further Work

5.1 Conclusion

In our team's perspective, we have made significant adjustment and changes for the past six months. To our expectation, the project gradually has a scale of integral system.

From my perspective, I not only gain high proficiency in JS coding of the framework of Vue, but also multiple front-end charts and plugins in the field of visualization. I gradually develop the intellection ability of converting digital data into logical and beautiful charts, and analysis of the correlation between numbers and figures.

In summary, our system not only possess rational logic and reasonable structure for humanized user experience, but also have outstanding ability in visualizing the earthquake 'event' data in multidimensional points of view. User could browse and operate the system as an 'administrator' by using the humanized functions like login in, log out, simulation of registration, user & role information management. More importantly, the diversified charts and statistical data content provide them an overall exploration and research through social media platforms. We believe that the data exhibited will be of great beneficial to both the visitors who want specific information about certain earthquakes and disaster prevention & public opinion management.

5.2 Future Work

Frankly speaking, some incremental updates could be supposed in the following aspects

Expected Improves	Description
Video	We might lunch an official video on index page in later time, through JSdelivr.
Disaster Type	We might add more various disaster types such as 'typhoon', 'storm', 'epidemic', etc.
Media Type	We might also import more various Media Types like 'Zhihu', 'Post bar', 'Twitter', etc.
Data Magnitude	Our system only excavates data since 2019. We are eager to expand our data range into 5 years and provide functions for temporal interval.

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Acknowledgement

I would firstly show my sincere respect and appreciation to my supervisor. We have known each other since 2019. He is proficient in various realms, such as knowledge graph, graph neural network and database. He is insightful, always providing me points and feedbacks when I got confused. He is generous, purchasing and give me valuable opportunities to study in his group. Additionally, he provides me with crucial advice on improving the user experience and page design of the system. We trust our efforts, since we trust each other.

Then are my team members. We developed this system as a whole team and encouraged each other all the time. I cannot forget the time that we coded, debugged and tested together. Every time when I met some new difficulties about the sever or request failure, they would carefully scan and solve the problems as soon as possible. Without their innovative thoughts and considerate assistance, the difficulties for my development would explode.

Finally, my family. During the whole process of the final year project, I was still preparing for the master's application. It was a tough time for me. Without their love and support, I cannot imagine how tough my life will be.

Wish all the best!

Appendix

1

北京邮电大学 本科毕业设计（论文）任务书

Project Specification Form

Part 2 - Student

学院 School	International School	专业 Programme	e-Commerce Engineering with Law		
姓 Family name	Liao	名 First Name	Jianxiang		
BUPT 学号 BUPT Number	2017212938	QM 学号 QM number	171049114	班级 Class	2017215112
论文题目 Project Title	The Design and Implementation of a Website for Natural Disaster Monitoring based on multiple social media.				
(论文概述) Project outline	Natural disaster is closely related to our daily life. Monitoring natural disaster help make our society more secure. In this project, we are going to design and implement a website for natural disaster monitoring based on the social media, online news, etc. The website cannot only support to analyze text-based information of natural disaster, but also provide user management functions. The website will support to monitor at least three types of natural disaster.				
Write about 500-800 words					
Please refer to Project Student Handbook section 3.2	<p>Different from the current mainstream earthquake networks and disaster monitoring websites, our idea is not to start from or base on detection hardware, but rather from the mainstream social media such as Weibo, news or forums to crawl the data we need. We hope to extract valuable information through these social media data and messages, which are bound to have great potential for classification and property differentiation.</p> <p>Through processing, we can not only dig out some valuable data information about the disaster, such as the disaster level, time, location, affected people, etc. Also it can help us better explore and analyse people's emotions, tendencies, discussion heat, trends, and topics. Those processed and treated information will assist us to better understand the relationship between natural disasters and human society, which might help us to put future crises in a correct perspective later.</p> <p>Generally, there are four main tasks as following:</p> <p>1. Design and implementing the web frontpage for natural disaster monitoring.</p> <p>Understand the programming language to design the language. Learn about Django based Python back-end framework and Vue/Vuex JS, JQuery based front-end language framework, also database knowledge like MongoDB and SQL.</p> <p>Learn about plugins that display graphics and information data, such as MapTalks, Echarts, Element-UI, etc. Be able to use the code knowledge and plugins for web page development and data visualization, integrate my own ideas and originality and display the data processed in the background on the front page.</p> <p>Learn to use charts and data analysis tools, including 2D statistical charts, thermodynamic diagrams, knowledge graph, word cloud, etc. And added interactive functions like zooming and panning the visualization area, graph selection, content comparison.</p>				

1

	<p>2. Develop a user management model, supporting sign up, sign in, user profiling.</p> <p>An important aspect of this system is to add user-related actions. The starting point of my front-end page is not only the display of relevant content and pages, but also the system design and information management development from the perspective of improving user experience.</p> <p>The functions should include and support sign up, sign in, user profiling and other spare functions like user information management, user control, authority management, etc.</p> <p>3. Develop a story timeline of a disaster event, including visualizing the date, address, opinion of the event</p> <p>One of the most important aspects of our project is the visualization of past disaster event lines. By creating an event line, we can do a series of expansions to the “place” property.</p> <p>Our event line information should include not only location, time, but also the attribute information of disaster. It will also incorporate multiple disasters (at least three) and be able to jump from one event to another after clicking. And we’re going to add crowdsourced attributes like user opinions and sentiment analysis to show how people feel about these things.</p> <p>These will distinguish us from other information systems because we concatenate the content and the event to make a more inductive conclusion.</p> <p>4. Develop a dashboard for the backend data management and analysis, and add the discrimination attributes of the analysis function, like map, tendency chart, Line chart, data table, red marks, etc.</p> <p>In this case, backend data visualization is also a very important part since we should declare the accuracy of our data and the scientific nature of our work.</p> <p>We shall implement some functions like red map marker display, map quantity distribution, line chart like event heat curve, event development trend, also data table for processed message exhibition, etc.</p> <p>These are the basic presentation methods we have agreed upon, and we may add more plugins or presentation methods in the future by continuous learning from others’ information systems.</p> <p>Background reading material:</p> <p>[1] 何璇. 数据可视化在社交媒体中的应用研究[D].南京航空航天大学,2016. [2] 徐頤,朱广华,贾瑤.基于 VueJs 的 WEB 前端开发研究[J].科技风,2017(14):69. [3] 罗永梅.基于 Vue 的响应式数据可视化平台的设计与实现[J].信息技术与信息化,2020(09):20-22. [4] 沈皎佶.Vue.js 技术在移动应用可视化平台网页设计中的应用[J].数码世界,2020(09):96-97. [5] 尹凯.事件知识图谱平台设计及实现[D].电子科技大学,2019. [6] 王宁.基于 Web 的领域知识图谱构建平台的研究与实现[D].北京邮电大学,2019.</p>
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道德规范 Ethics	Please confirm that you have discussed ethical issues with your Supervisor using the ethics checklist (Project Handbook Appendix 2). [YES]

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	<p>Summary of ethical issues: (put N/A if not applicable)</p> <p>1. Will the participants be exposed to any risks greater than those encountered in their normal working life?</p> <p>I guarantee that there will not be any risks from physical and mental harm during an investigation. The risk of harm must be no greater than in ordinary life.</p> <p>2. Will the participants be using any non-standard hardware?</p> <p>No, the project involves only an online software and website, which will not occur in any non-standard hardware.</p> <p>3. How will participants voluntarily give consent?</p> <p>The project displays the functions and information online on our lab's server, which is under our control, so when the user click the URL and direct to our webpage, it means that they give consent to our webpage and is willing to view our project.</p> <p>4. Are you offering any incentive to the participants?</p> <p>We will not give any incentive to the participants.</p> <p>5. Is there any intentional deception of the participants?</p> <p>I guarantee that there is no intentional deception of the participants, and I won't intentionally forge information or mislead participants. However, some of our information and data is crawled from social media and thus they may not be accurate enough.</p> <p>6. Are any of your participants under the age of 16?</p> <p>Since the website doesn't hold any sensitive information nor harmful elements for participants under 16. So we didn't set permission or verification task to guarantee the age of our users. So there would be participants under the age of 16.</p> <p>7. Do any of your participants have an impairment that will limit their understanding or communication?</p> <p>My project involves no difference between normal people or people with impairment. As long as they're not mentally handicapped or blind, they can use our webpage naturally.</p> <p>8. Are you in a position of authority or influence over any of your participants?</p> <p>I guarantee that I won't be in a position of authority or influence over any participant. My project is in the position of telling and showing rather than controlling, on the other side, users themselves have the right to control their viewing and select their favourite choice during experiencing.</p> <p>9. Will the participants be informed that they could withdraw at any time?</p>
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Website for Natural Disaster Monitoring based on multiple social media

	<p>I promise that I will inform the participants that they have the right to withdraw at any time during the investigation or usage. Or they can simply click on the 'exit' button to leave our project website.</p> <p>10. Will the participants be informed of your contact details?</p> <p>I guarantee that all participants would be able to contact us or view our contact information on certain place of our website. We will intentionally leave one place for our user to give their valuable opinions by using the contact details on our websites.</p> <p>11. Will the participants be debriefed?</p> <p>There will probably no debrief of our participants. Our participants are recommended to use our website as they like. And our tasks are to show our achievements rather than asking our users with questions like debriefing.</p> <p>12. Will the data collected from participants be stored in an anonymous form?</p> <p>I guarantee that all user data (like only Weibo ID or user name) would be stored securely and in an anonymous form or in our secure database (By using MongoDB and SQL), without recording any real world information like name or phone, etc.</p>
<p>(中期目标) Mid-term target.</p> <p>It must be tangible outcomes, E.g. software, hardware or simulation.</p> <p>It will be assessed at the mid-term oral.</p>	<ol style="list-style-type: none"> 1. Summary of VUE framework deployment and related configuration knowledge, code learning and implementation knowledge. 2. Related document knowledge recording and learning, including the learning of various JS and JQuery components, such as Element-UI, e-charts, MapTalks, etc. 3. Learn the general principles of separation of front-end and back-end, and their corresponding use of ajax and axios. 4. Initial completion of 7 different pages. Includes: "Area Distribution", "Map notes", "Latest Information (for both News and Weibo)", "Earthquake Overview (map marker)", "Earthquake Details", "User Information" 5. Complete the general visual content setting of part of the page, including kinds of statistical charts, tables, and e-charts. 6. Integrated into the "Weibo" and "News" two kinds of social media information 7. Complete the specific earthquake tracking, including the details of a single earthquake and the corresponding location and event. 8. Add or supplement the location event line; Also details that ensure that the page event line can jump to the corresponding event. 9. Complete the incremental realization of data from 2 years to 5 years, realize the diversification of data expression, and optimize the expression form and content accuracy of part. 10. Add user-related management functions, including various information management operations, user authorization management, etc. 11. Complete the marker of Earthquake on map and showing of relevant information. Complete the jump of map marking based on coordinates and improvement of map content. 12. Import knowledge map and show relevance description, design linkage and skip functions for knowledge map. 13. Demonstrate user interface and logical workflow chart of the system.

Website for Natural Disaster Monitoring based on multiple social media

	<p>If the Website (software) is ready:</p> <p>14. You can view the beta version of the project through http://152.136.59.62 (Disaster-monitor) system</p> <p>15. You can send through your valuable opinions to my E-mail: 2017212938@bupt.edu.cn</p> <p>16. It will be in an open-test state and we are looking forward to receiving valuable opinions from different users.</p>
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Work Plan (Gantt Chart)

Fill in the sub-tasks and insert a letter X in the cells to show the extent of each task

	Nov 1-15	Nov 16-30	Dec 1-15	Dec 16-31	Jan 1-15	Jan 16-31	Feb 1-15	Feb 16-29	Mar 1-15	Mar 16-31	Apr 1-15	Apr 16-30
5. Task 1. Design and implementing the web frontpage for natural disaster monitoring.												
Background reading of Django based Python back-end framework and Vue/Vuex JS, JQuery based front-end language framework	X	X										
Learn about the display graphics and information data, such as MapTalks, Echarts, Element-UI	X	X										
Use charts and data analysis tools on display, including 2D statistical charts.			X	X								
And added interactive functions like zooming and panning the visualization area, graph selection, content comparison.			X	X	X	X	X					

6. Task 2. Develop a user management model, supporting sign up, sign in, user profiling.												
Design the user interface.			X	X	X	X						
Add user-related actions like user login/logout, sign in/sign out						X	X	X				
Add other critical functions for user like user profiling and user information management					X	X	X	X	X			
Implement administrator/user functions like user control, authority management, etc.						X	X	X	X			
7. Task 3. Develop a story timeline of a disaster event, including visualizing the date, address, opinion of the event.												
Include not only location, time, but also the attribute information of disaster to disaster event line.		X			X	X	X	X	X			
Be able to jump from one event to another after clicking.	X	X			X	X			X	X		
Merge at least 3 types of social media and import multiple disasters (at least three) into event line for information integration.				X	X	X	X	X				
Fuse data for COVID-19 and customized their characteristic and contents							X	X	X	X	X	
Task 4. Develop a dashboard for the backend data management and analysis, and add the discrimination attributes of the analysis function, like map, tendency chart, Line chart, data table, red marks, etc.												
Realize red map marker display, map quantity distribution, line chart like event heat curve, event development trend, also data table for processed message exhibition, etc.						X	X	X	X	X		
Optimize the interface to become more user-friendly. Add functions like zooming or panning the visualization area and adjust the page fit.									X	X	X	X
Write down a user manual (documentation webpage) to facilitate usage.								X	X	X		
Write down the report										X	X	

北京邮电大学 本科毕业设计（论文）初期进度报告

Project Early-term Progress Report

学院 School	International School	专业 Programme	e-Commerce Engineering with Law		
姓 Family name	Liao	名 First Name	Jianxiang		
BUPT 学号 BUPT number	2017212938	QM 学号 QM number	171049114	班级 Class	2017215112
论文题目 Project Title	The Design and Implementation of a Website for Natural Disaster Monitoring based on multiple social media.				

(已完成工作) Finished Work:

Researched Work :

Front-End Framework Based on Vue-JS

Before developing the project, we came to a decision to implement the VUEJS as the front-end framework. Vue was adopted because it is based on the separation of front and back ends, which is very important for us because development speed is very difficult to coordinate in real development situations. The basic concept of Vue is to use JS to replace the original traditional code blocks, and take AJAX asynchronous loading to achieve the effect of data update. In this case I am able to focus more on my personal design on front-end, and then my cooperator just putting the data through URLs then we can communicate. The fundamental employment of Vue-JS depends on my degree of proficiency on JS, but how to innovatively use them depends on your avant-garde thoughts and organizing ability on code.

Similar to a traditional framework, Vue uses a View layer, a Data layer, an Interface API layer, a Routing layer, a Plug-in layer, a Layout manager, a Component manager, and even a Mock Data layer. The configuration and encapsulation of VUE also provides greater flexibility. I spent a long time to learn its code block knowledge and application, and have a good grasp of the realization and expression of its functions and mechanism.

Relevant Website Layout Learning

A large amount of time was spending by me to learn about layout and style of other's relevant websites. These include the Johns Hopkins epidemic analysis system, Bing's data display system, and various similar disaster monitoring systems. It is a very efficient way of learning-by-learning others' web layout design, relevant data processing methods and data presentation methods, referencing their advantages and integrating them into my own project. Besides, by learning templates and objective functions of certain categories of websites, I have a better command of relevance and jump logic between pages, which enables me to further my development with more humanized ideas.

Plug-in Implementation Learning

Learning and using plug-ins is also a very significant part of my development process. Many user-friendly functions are inseparable from the implementation of plug-ins. I often browse and learn different diverse plug-ins on relevant sharing websites such as JS official website, MapTalks, W3C, ECharts Official, GitHub and so on. If there is a plugin that fits our website and can be used on our website, I will immediately download it and practice its functions and realization logic. Therefore, many of the humanized functions of our website are using powerful plug-ins in the aspects of timeline, maps, diagrams, annotation, UI Elements; At the same time, the optimization of the plug-in is also an obbligato part that I need to constantly adjust the plug-in to achieve the desired effect, rather than simply copying it directly.

Data Transmission and Test

Data transfer and validation has always been an important part of our project deployment and exploitation. Since we applied the concept of front and back end separation, we always use Axios (encapsulated Ajax) that comes with Vue for data transmission. After the format is well defined and structured in advance, the back end places the data on the corresponding page, and the front end makes a data request, then the data can be loaded to the page asynchronously.

We have encountered many difficulties in the process of trying, such as foreign requests, formatting errors, data overload, unclear data disturb, and so on. Through our joint efforts and study, we gradually understand and resolve them.

Data Presentation and Interaction Functions

We not only spend a lot of time defining the format of the data, but we also conduct great effort on discussing how the data should be presented and how they will be stressed in certain way. This includes, but is not limited to, pie charts, bar charts, line charts, simple charts, and maps. After many times of discussion and research, we adopted many different presentation methods, which are helpful for us to better compare the processed data and highlight the key points we want to present. Later, we might even adopt knowledge map for relevance description, in which case user are more likely to have a better command of the correlation between different events or charts.

In order to be more humanized and easier for using, we also devote a lot of endeavor to research and discuss about Interaction functions, which will be perfect and improved when data volume rise, or pages become complex and complicate. I have drawn lesson from a lot of famous website for learning their Deep or shallow interaction functions, and plan to try my best to imitate their smart design and thoughtful functions.

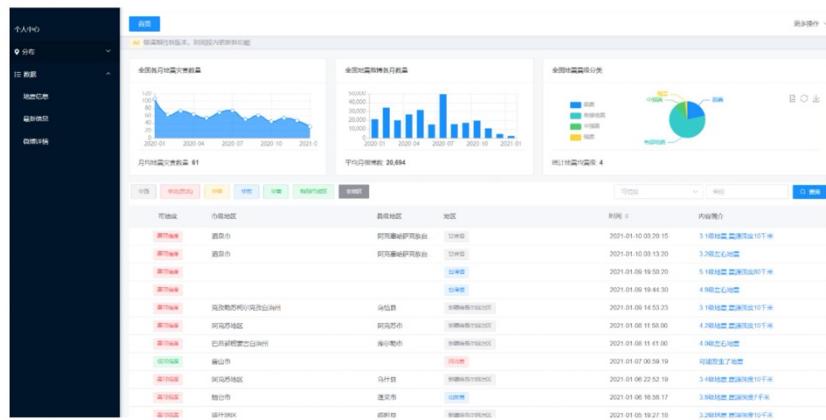
Work Completed

Data – Earthquake Information Page

- Added a statistic of real-time national monthly earthquake disaster number in wave graph.
 1. including 12 months from last year to up to date.
 2. Calculated the average number of disasters per month.
 3. An automatically adjust floating remind box is provided for the number of earthquakes per month.
- Added a statistic of real-time Weibo number in bar chart.
 1. including 12 months from last year to up to date.
 2. Calculated the average number of Weibo per month.
 3. An automatically adjust floating remind box is provided for the number of Weibo number per month.
- Seismic magnitude classification has been added with a Pie chart.
 1. Statistics of four different earthquake magnitude, respectively, for weak earthquake, felt earthquake, middle earthquake, strong earthquake are calculated.
 2. Append click function on side category to show/hide different earthquake kinds.
 3. An automatically adjust floating remind box is provided for the different kind of earthquake, including their number and related accounted at all.
 4. The mean magnitude was calculated.
- Added list of latest seismic events, whose capacity is between 700 and 900 articles.
 1. The data table include 6 kinds of main descriptions and columns for describing their attributes. Including ‘credibility’, ‘city’, ‘province’, ‘area’, ‘time’ and a structured base description of simple magnitude and their lengths affected.

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2. The ‘credibility’ is categorized into ‘high’ or ‘low’, which is classified by the reliability of the resource from Weibo data, for example, whether the publisher is certificated or not.
3. The ‘city’, ‘province’, ‘area’ is directly distinguished and recorded by the location of Weibo which is published. This information is transmitted into a text information.
4. The ‘time’ is directly provided by the time of Weibo posted, we arrange the seismic information in descending order by time.
5. The ‘description’ part is actually a link which redirect to the detail information of certain events. The description simple imply the magnitude of this earthquake event and also the length of its affect.
6. A useful and intelligent pagination is applied in the button side of data page. You can control the page you want to go; how many articles you want to read in each page; the total number of events we have calculated and put in this page, and also the direct number form which for you to fill in and browse.
7. Different events from different provinces may have different colors. This is classified by the region. For example, South in green, north in red, east in blue, etc. Regions contains all the provinces it has, and this can be queried on the internet.
8. Events can be queried through regions. By clicking the regions button, events in this region are rearranged and shown.
9. Intelligent search: Search functions base on ‘credibility’ and ‘province’ are implemented in the right upper side of the page. Select of ‘high’ and ‘low’ credibility will show the result of relevant events. Also, people can enter whole or key words of province then they can search with the result.



Data – Latest Information Page

- Add a data table for Latest Earthquake Weibo Information
 1. This page contains 7 simple columns(attributes) which demonstrate the data we have crawled from the Weibo, including ‘User information’, ‘Relevance’, ‘Date’, ‘Comment number’, ‘Forward number’, ‘Like number’, and simple introduction.
 2. By viewing the user information part, we can view the simple information about the users’ name or ID.
 3. ‘Comment number’, ‘Forward number’ and ‘Like number’ are three simple number which directly indicates the heat of certain Weibo.
 4. Also, its date indicates the time when this Weibo is published. We rearrange those Weibo in a descending order, which is easier for you to view the latest information.
 5. ‘Relevance’ describes this information is whether a junk information or not. Sometimes we may find that the information getting through our model is not satisfied with our expectation for this event, or simply the article is not relevant or valuable, so we describe it as ‘Not relevant’.

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6. ‘Description’ directly indicates the content and details of the Weibo. This is also a link which directly link you to the outside Weibo to prove our authenticity of the information. If the content is too long or exceed the fixed length of our column, then a floating table will show.
7. A well-structured pagination is also included in this page, which has the same functions as the Information page.

最新地震新闻信息		最新地震新闻信息				
用户信息	相关程度	发表日期	评论数	转发数	点赞数	内容简介
地方就地取材	无关	2021-01-10 12:59:17	0	0	0	今早10点，震是地震了。他们现在在十四楼，你干嘛不快点。到广宇说要真地震了。你现在想都下地跑了
杰杰的盔甲	无关	2021-01-10 12:59:16	0	0	0	【傻儿子】谁是老爹
新创蓝周	相关	2021-01-10 12:59:11	0	0	0	梅X_2008年汶川地震的患者有不少心理康复，甚至失去了活下去的勇气。而抑郁症给了他们活下去的希望。
今天也是想睡觉的小蜗啊	无关	2021-01-10 12:58:18	0	0	1	数据源因受制于其他数据的验证机制限制，宋朝李易，晏几道词风化，有以学宋词有学主其后词社往...
一万个压力大	无关	2021-01-10 12:55:18	0	0	0	科班出身也是这种神态。真正经历过大地震的我才知道这是很疼的
Hypgrave_	无关	2021-01-10 12:55:18	5	0	0	林晓峰-见怪不惊的微博大概率是2011的林晓峰-见怪不惊微博被YS林晓峰最好的安排林晓峰your...
Eason333333	无关	2021-01-10 12:54:19	0	0	0	没时间怎么公房（7一次3-5%。感觉还是蛮吓人的。想说还蛮差 我们公司2.4的东西1.....转不可能是1.4那么...
不和的上面那2	无关	2021-01-10 12:54:19	0	0	0	地表断裂基本上是错动的错动，高位断了不然地震伤，低位断一般来说得 地震的伤这种伤会很多
十七LEAF	相关	2021-01-10 12:52:21	4	0	4	今天突然地震了？
上海市地震局	相关	2021-01-10 12:52:21	0	0	0	中国地震台网正式测定：01月10日11时54分，在阿根廷(南纬24.06度，西经66.66度)发生8.0级地震，震源深度200公...
海归海归小翁翁	无关	2021-01-10 12:51:22	0	0	0	天啊地震！地震
胡乱行	无关	2021-01-10 12:49:23	0	0	5	13岁被安排订婚生娃的女生泪崩：我跟爸妈吵了13年了...，好想，希望爸爸妈妈以后不要这样对我
白衬衫Buc	无关	2021-01-10 12:46:22	0	0	0	一双手、二双手、三双手「三天之内，农忙时第一二三把手均需用，山谷会震断的地轴」
八字地理骗局	无关	2021-01-10 12:49:22	0	0	0	大多数人都是趋吉避凶的平手派，这很正确。俗话说就是一大把拳头去打人，尤其想招惹会教他出来讲。只有在这一行...
樱花雨和板蓝根	无关	2021-01-10 12:46:23	1	0	1	「某店因为生意太好所以8:30就卖完的啊Yeu~ 哪孔地震 红遍重现 本店主真的又累又搞笑才好，苦着脸安慰L...
tangshan哥	相关	2021-01-10 12:47:26	0	0	1	突突！阿明江发生6.0级地震...
跟着君游车	相关	2021-01-10 12:46:30	1	0	8	【13岁被安排订婚生娃的女生】1月9日，在四川大渡河，这个赛季，在这次地震中被...

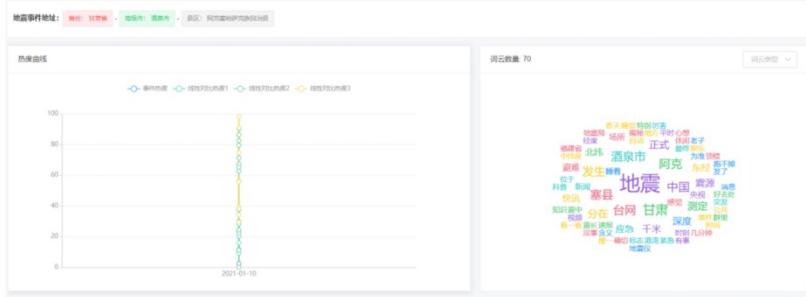
- Add a data table for Latest Earthquake News Information

1. This page contains 5 simple columns(attributes) which demonstrate the data we have crawled from the News Media, including ‘User information’, ‘Relevance’, ‘Date’, ‘Title’, and simple introduction.
2. By viewing the user information column, we can get the simple information about the famous media’s name or authoritative publisher.
3. Also, its date indicates the time when this News is published. We rearrange those News in a descending order, which is easier for you to view the latest information.
4. ‘Title’ is an important information when viewing news; In this part, we simply extract the title from those News or seek out by our model, which directly reveal the main idea and purport of this News.
5. ‘Description’ directly indicates the content and details of the News. This is also a link which directly link you to the outside News to prove our authenticity of the information. If the content is too long or exceed the fixed length of our column, then a floating table will show.
6. A well-structured pagination is also included in this page, which has the same functions as the Information page.

最新地震新闻信息		最新地震新闻信息			
用户信息	相关程度	发表日期	标题	内容简介	
澎湃新闻网	相关	2021-01-10 12:44:00	阿根廷萨尔塔省发生5级地震，震源深度222公里	新华社快讯：据外媒报道，南美地震学研究中心1月10日发布消息，阿根廷萨尔塔省当日发生5级地震，震源深度222公里。	
安徽交通广播	相关	2021-01-10 12:42:10	突发地震！	1月10日11时54分在阿根廷(南纬24.06度，西经66.66度)发生8.0级地震，震源深度200千米。1月	
中国新闻网	相关	2021-01-10 12:42:55	阿根廷北部发生5.1级地震 震源深度82.02千米	北京时间1月10日11时54分许，阿根廷北部省份附近发生5.1级左右地震，震源深度82.02千米。	
央视	相关	2021-01-10 12:42:00	阿根廷发生6.0级地震 震源深度200千米	据阿根廷国家地震局消息，当地时间1月10日11时54分许，阿根廷发生6.0级地震，震源深度200千米。 1月10日11时54分在阿根廷(南纬24.06度，西经66.66度)发生8.0级地震，震源深度200千米。	
新华网	相关	2021-01-10 12:17:49	阿根廷萨尔塔省日前发生5级地震	新华社快讯：据外媒报道，南美地震学研究中心1月10日发布消息，阿根廷萨尔塔省日前发生5级地震，震源深度222公里。	
中国地震台网速报	相关	2021-01-10 12:17:03	地震快讯	地震快讯：01月10日11时54分在阿根廷(南纬24.06度，西经66.66度)发生8.0级地震，震源深度200千米。 1月	
中国地震台网速报	相关	2021-01-10 12:16:55	阿根廷发生6.0级地震	1月10日11时54分在阿根廷(南纬24.06度，西经66.66度)发生6.0级地震，震源深度205千米。震中位于南纬24.06度，西经66.66度。	
花生说球	相关	2021-01-10 12:15:20	大开眼界！健将哥哥玩坏了地震演习，小朋友们的真棒！	地震快讯：01月10日11时54分在阿根廷(南纬24.06度，西经66.66度)发生8.0级左右地震，震级结果以正...	
中国地震台网速报	相关	2021-01-10 12:07:20	地震快讯	地震快讯：01月10日11时54分在阿根廷(南纬24.06度，西经66.66度)发生8.0级左右地震，震级结果以正...	
中国地震台网速报	相关	2021-01-10 12:07:08	阿根廷南部附近发生5.1级左右地震	1月10日11时54分在阿根廷(南纬24.06度，西经66.66度)发生5.1级左右地震，震中位于南纬23.99度，西经66.70度。震级结果以正...	
中国日报网	相关	2021-01-10 12:03:53	甘肃一地发生3.1级地震，震源深10千米	地震参数：地震参数：1月10日3时10分在甘肃省酒泉市肃北蒙古族自治县发生3.1级地震，震源深度10千米。震中位于北纬39.40度，...	
新浪美股	相关	2021-01-10 11:58:57	阿根廷萨尔塔省附近发生5.0级地震	地震参数：地震参数：1月10日3时10分在甘肃省酒泉市肃北蒙古族自治县发生5.0级地震。	
厦门网	相关	2021-01-10 11:52:00	台湾花莲县附近发生4.3级地震，震源深度11千米	最新消息： 01月10日11时23分在台湾花莲县(北纬23.77度，东经121.49度)发生4.3级地震，震源深度11千米。 ...	

Data – Weibo Detail Page

- This page can be considered as a subpage of information page which contains the information of certain event. If you directly click on this page without redirecting from information page, then this will automatically show the latest event.
- Top bar for location
 1. This top bar shows the province and city, even the area (if the data resource indicates) of this event. And all those three frames are structured in different colors.
 2. Province and city are clickable. By clicking the province or city component, you will be redirected to the location detail page (which will be explained later), which contains the information and events of all the recent earthquake in the place you click.
- Heat Line Diagram
 1. This diagram is set for describing the heat and attention among people in the Weibo, which is analyzed and form as a line diagram.
 2. Each event may have different time or duration of the heat line, maybe 2 months or maybe just a few days.
 3. We also give another 3 lines for comparison, which can also be changed to meet the later demand like heat with different year or month.
- Word Cloud Diagram Card
 1. This diagram contains the information of relevant key words of this event, which are analyzed and selected by our model.
 2. The bigger the key word, the more important or popular this word will be.
 3. Color are stipulated and selected to be different beside each two different key words, so people are easier to distinguish them. However, there is no certain relationship between key words and colors.
 4. The number of key words is calculated and displayed on the upper side bar.
 5. People can also select the type of the word cloud. People can select the heat cloud or topic cloud; both have different theme and content.
 6. Key words are clickable; When clicking on certain word, the page will redirect you to search the information about this key word on Weibo App, which is useful and straightforward.



• Numeral Statistics Card

1. This card contains the deeper information that we have accumulated and calculated about this event. It contains 'Total number of Weibo', 'Original Weibo Number', 'Forward number', 'News number', 'Media number', 'Formal user' and 'Authenticated famous user'. Those 7 categories are given different colors.
2. Two or three kinds of categories are selected to compare. We use pie chart to indicate their proportions and relevance to each other. When you put your mouse on certain category, a floating box will show up to display the category name and number.

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- 3. The bigger the number of certain categories, the larger radius of this part of Pie will be.
- 4. When you click on the classification section of this card, the corresponding category will show/disappear.

- Distribution Diagram Card

- 1. This card contains the geographical position of all the Weibo we have crawled of this event. The distribution and position are demonstrated through a China map, which is differentiated by regulated province.
- 2. The larger number of Weibo the province has, the deeper color this province will have.
- 3. When putting your mouse on certain province, a floating box will show to indicate the province's name and corresponding number. (-/null will represent 0)
- 4. There is also a line diagram which indicates the number of color shade. When moving your mouse on this line, the province with corresponding number of Weibo will show up and change its color to yellow.



- Event Line Card

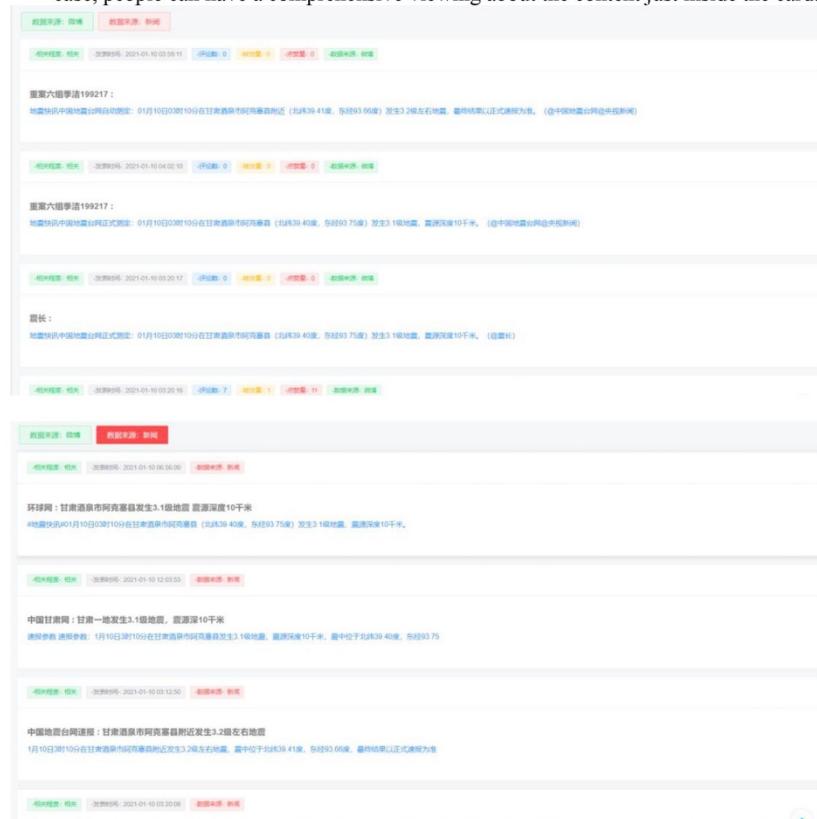
- 1. This card is pretty simple, it indicates the relevant events (earthquakes) of this place in about 2-3 months.
- 2. This line may have several cards which contains the relevant information of its earthquake, including area, time, magnitude of the earthquake and also the length of its effect. Those cards are arranged in an order from left to right, representing from early to latest.
- 3. When the number of those card exceeds the length of the page, a rolling function of this card will automatically show up and user can slide this block to right.
- 4. Those cards are clickable, they represent the result events of our model. When you click on certain card, it will search the information and data of this event and reload the detail information page to show the result.
- 5. In a word, they are interlinked and coherent.



- Displaying Card

- 1. Displaying card is designed for showing the direct information of each Weibo/News. So by now we have regulated two categories, Weibo in green and News in red.
- 2. When clicking the Weibo button (or simply first entering this page), Weibo information will show in several cards to display their information. Information includes 'Relevance', 'Date', 'Comment Number', 'Forward Number' and 'Like number'.

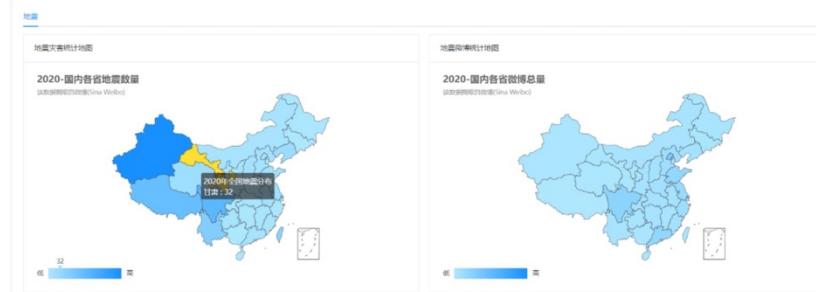
3. Each Weibo Card will mainly contain the information of users' name and their contents. The content is also a link which will directly lead you to the original Weibo in the application. It shows our authenticity and matter-of-fact attitude and willing to combine our ambition of processed data with raw material.
4. User can also click on the News button. News include 5 main information like 'Relevance', 'Date', 'Source', 'Title' and 'Content'.
5. News are simpler and more direct, with the 'Title' and 'Content', people can get a good command of what the news is mainly talked about. 'Title' is combined of media's name and headline. 'Content' is also regulated to be a link which will directly lead you to the original News in the application.
6. For humanized use, we apply a sliding block for that news which has long content. In this case, people can have a comprehensive viewing about the content just inside the card.



Distribution – Province Calculation Page

- Earthquake Calculation Card & Earthquake Weibo Calculation Page
 1. This card is quite the same as the distribution diagram card in data page.
 2. This card contains the geographical position of all the earthquakes we have analyzed to now. The distribution and position are demonstrated through a China map, which is differentiated by regulated province.
 3. The larger number of Weibo the province has, the deeper color this province will have.
 4. When putting your mouse on certain province, a floating box will show to indicate the province's name and corresponding number. (-/null will represent 0)

5. There is also a line diagram which indicates the number of color shade. When moving your mouse on this line, the province with corresponding number of earthquakes will show up and change its color to yellow.
6. These are also the same to the next card – Weibo Map, which is also calculated and the number of all the Weibo we have processed and display in a similar form.



Map Marker with Location Page

- This page indicates the location of earthquake. Usually we consider the location of Weibo or the address information inside the Weibo, and then put them into our model. After carefully selected and analysis, we transfer them into complex coordinates.
- We use a map layer offer by Baidu in black colors. I adjust the horizon to fit the general view of China in a comfortable angle.
- Each coordinate is assigned to a marker offered by MapTalks. The marker is red and when you put your mouse on those markers, a floating table will show up. It contains the important information like ‘Province’, ‘City’, ‘Area’, and also the earthquake’s ‘Time’, ‘Magnitude’, ‘Lengths’. When you put your mouse away from the marker, the floating table will automatically disappear.
- Specially, I assigned another important attribute called ‘Earthquake Times’ for each area. By viewing this attribute, they are able to find whether this place is risk as earthquake are common here.
- Those markers are also links; When you click on certain maker, it will redirect you to the location details page. This page contains all the earthquake information and articles about that location. The number is exactly the same as the marker has provided.



Location Detail Page

- If you directly click on this page without redirecting from location page or information page, then this page will automatically show the latest event.
- As I have mentioned, this page is designed for showing all the relevant and recent earthquake in the place you clicked or selected.
- In the top bar there are two label which indicate the province and city you selected.
- I arrange those earthquakes as vertical event line. From most early to latest, you can direct see each earthquake's time, province, city, area.
- Also, I regulate the subtitle to be the magnitude and length, which is clickable. By clicking the card, you will be led to the Weibo detail page to view the detail information of this event. This also show our design idea of coherence and relationship-based monitor system, which will be strengthened in our future design with the knowledge map.
- I also add a data table as a supplemental explanation, which might be relieved or deleted at any time.
- In order to search the earthquake that user want, they can choose to search by 'relevance' or 'city' (province is a premise in this page). User can click on the button in top bar to select and screen the reliable or unreliable events. By entering the key words or full name of certain city or area, the user can also screen the event place that the earthquake happen.



Problems and Solutions

Problem 1 and Solution 1

P: There has never been an attempt to introduce a knowledge graph or relevant way of description.
S: By searching relevant website/project and reviewing the process of building maps and model of knowledge map, I can understand how to practically apply JQuery or JS on implementing a recommendation model to satisfy this.

Problem 2 and Solution 2

P: It is not so easy to ascend the time of data accumulated in relevant charts, which might bring about Graphics dislocation or component is too small.
S: Consider using button components or sliding components for flexible presentation.

Problem 3 and Solution 3

P: Map markers for event location will be displayed after long time loading or refreshing.
S: After a long time of trying and investigating, I found that the display error might be caused by the excessive data loading. might consider using another kind of marker or motion command to fix this problem, which would have better compatibility with existing map layer.

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是否符合进度? On schedule as per GANTT chart?

A little bit slower than expectation; (略慢于预期节奏)

下一步 Next steps:

- 1. Add a home page and append relevant classification guidance and special/significant events, keyword, etc.
- 2. Append Documentation page in sidebar menu, including user manual and website instructions.
- 3. Research and imitate solutions of importing knowledge map for relevance description and recommendation.
- 4. Add the second kind of disaster.
- 5. Intensify user interface friendliness and operability; Improve relatedness among pages of the same disaster categories and also different ones.

北京邮电大学 本科毕业设计（论文）中期进度报告

Project Mid-term Progress Report

学院 School	International School	专业 Programme	e-Commerce Engineering with Law		
姓 Family name	Liao	名 First Name	Jianxiang		
BUPT 学号 BUPT number	2017212938	QM 学号 QM number	171049114	班级 Class	2017215112
论文题目 Project Title	The Design and Implementation of a Website for Natural Disaster Monitoring based on multiple social media.				
是否完成任务书中所定的中期目标? Targets met (as set in the Specification)?					
已完成工作 Finished work:					
<p>Researched Work Completed:</p> <ol style="list-style-type: none"> 1. Summary of VUE framework deployment and related configuration knowledge, code learning and implementation knowledge. <ul style="list-style-type: none"> ● Tremendous knowledge of VUE framework was accumulated and learned by during the early stage of my thesis project, including a lot of material packs and configuration file. I have learned about VUE syntax and code block knowledge from channels such as CSDN, W3School, GitHub, CNBlog, etc. Those platforms provide sufficient materials and examples of both VUE implementation and modification, also relevant questions to solve. By now, I claimed to have a good understanding of Vue's code composition, instance implementation, logic, and property configuration. ● By developing my pages and deploying my project, I practically implement the knowledge I learned from those resources. The pages contain VUE entities were carefully modified and given the attributes to meet our purpose design, in which case shown the application of my knowledge. (http://152.136.59.62/#/index) 2. Related document knowledge recording and learning, including the learning of various JS and JQuery components, such as Element-UI, E-charts, MapTalks, etc. <ul style="list-style-type: none"> ● Various JS and JQuery components were learned during my modification and deployment of my final thesis project. As a matter of fact, those front-end scripts and make up languages are indispensable from developing. Especially, I accumulated and implemented the knowledge of complicate JS when generating methods, changing the parameter of 2D components, submitting forms, data storage, requesting/receiving data, and refracting the statistic like pagination, etc. ● The whole main skeleton and important material package of my project is based on Element-UI. I implement and update the elements with each edition of my project recording the solution and methods on Element-UI, those components concisely express our needs and purpose of our data exhibition. ● E-Charts and map layer tool like MapTalks portrays another important role in my project. After learning their critical samples and variables assignment way, I have a command of their usual 					

Website for Natural Disaster Monitoring based on multiple social media

application. Certain measuring charts and tables in my page is adopted with E-charts modules. Further, I will deploy more useful diagrams like their 3D histogram, relevance description graph, sun figure in the near future. In my map label page, I adopt MapTalk's layer and markers for earthquakes' location specification. I have read each instantiation and tools of MapTalks and I am confident to improve and optimize my label soon.

3. Learn the general principles of separation of front-end and back-end, and their corresponding use of Ajax and Axios.

- By now, I have successfully developed the VUE project with its principles in asynchronous time stage, with separation in front and back end.
- I acquire sufficient knowledge of both AJAX and Axios when communicating knowledge with my back-end worker. AJAX is adopted when submitting request to acquire data in URL, which is packaging in API layer with formal structure and request method. Axios is adopted in certain pages when component like certain charts need to be loaded asynchronously, which is rather quicker and more direct. (As you can see from the samples below)

```
export function getWeiboData(data) {
  return request({
    url: "http://152.136.59.62:8080/earthquake_macroscopic/map2",
    method: "post",
    data,
    body
  });
}

export function getStormData(data) {
  return request({
    url: "storm/getStormData",
    method: "post",
    data,
  });
}
```

```
async fetchTimeLine() {
  if (this.number == null) {
    axios
      .get("http://152.136.59.62:8080/earthquake_microscopic/list2")
      .then(res) => {
        for (let i = 0; i < res.data.data.length; i++) {
          this.items.push({
            title: res.data.data[i].province +
              res.data.data[i].city +
              res.data.data[i].area,
            content: res.data.data[i].time + " 发生: " + res.data.data[i].info,
            number: res.data.data[i].number, //设置number数据
          });
        }
      }
    })
  }
}
```

Development Work Completed:

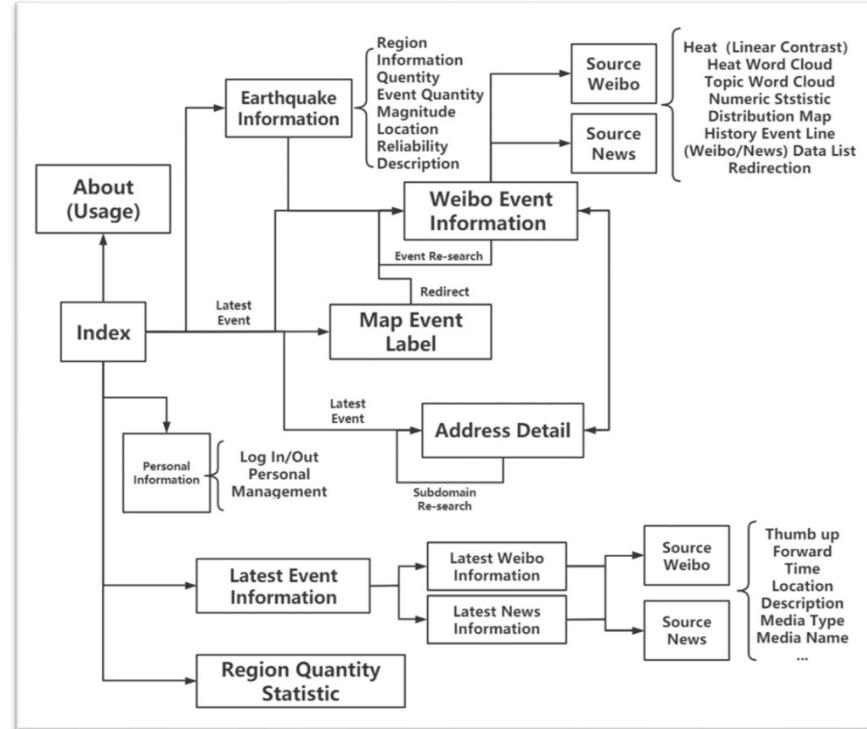
1. Initial completion of 7 different pages. Includes: “Area Distribution”, “Map notes”, “Latest Information (for both News and Weibo)”, “Earthquake Overview (map marker)”, “Earthquake Details”, “User Information”.
- All those 7 pages are finished and can be reached through our website. I will continuously update and optimize those pages in the near future. (Those pages are arranged in the index menu below)



2. Demonstrate user interface and logical workflow chart of the system.

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- User interfaces are approximately designed and shown in the upper 7 different pages. Interfaces under production environment is almost the same with interfaces in formal user environment after the updates.
- Logical workflow is generated in this version up till now. It is adjusted and optimized for times, and I will try my best to structure it into more intact and manifold chart in the future with incoming functions and modifications. (The picture of logical flow can be seemed below)



3. Complete the general visual content setting of part of the page, including kinds of statistical charts, tables, and e-charts.

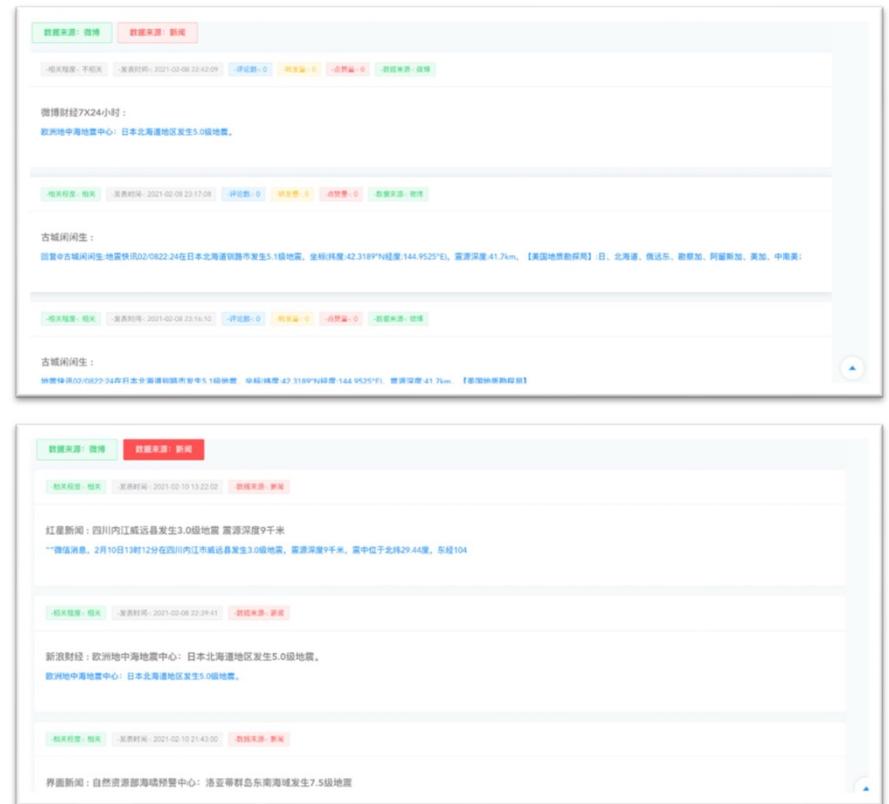
- The general visual content of the setting of the pages is determined and shown in my website pages. I deployed statistical charts, data table, data list, histogram and pie charts, heat curve, word clouds, timeline and relevant useful 2D graphs.
- Those elements are carefully arranged and deposit in the right and relevant places.

4. Integrated into the “Weibo” and “News” two kinds of social media information.

- By now, I have only integrated ‘Weibo’ and ‘News’ just in Weibo detail pages. In this page, the user can choose to select the source information on certain events/cases, thus not only get the comprehension view about ongoing earthquake, but also people’s attitude and standpoints.

Website for Natural Disaster Monitoring based on multiple social media

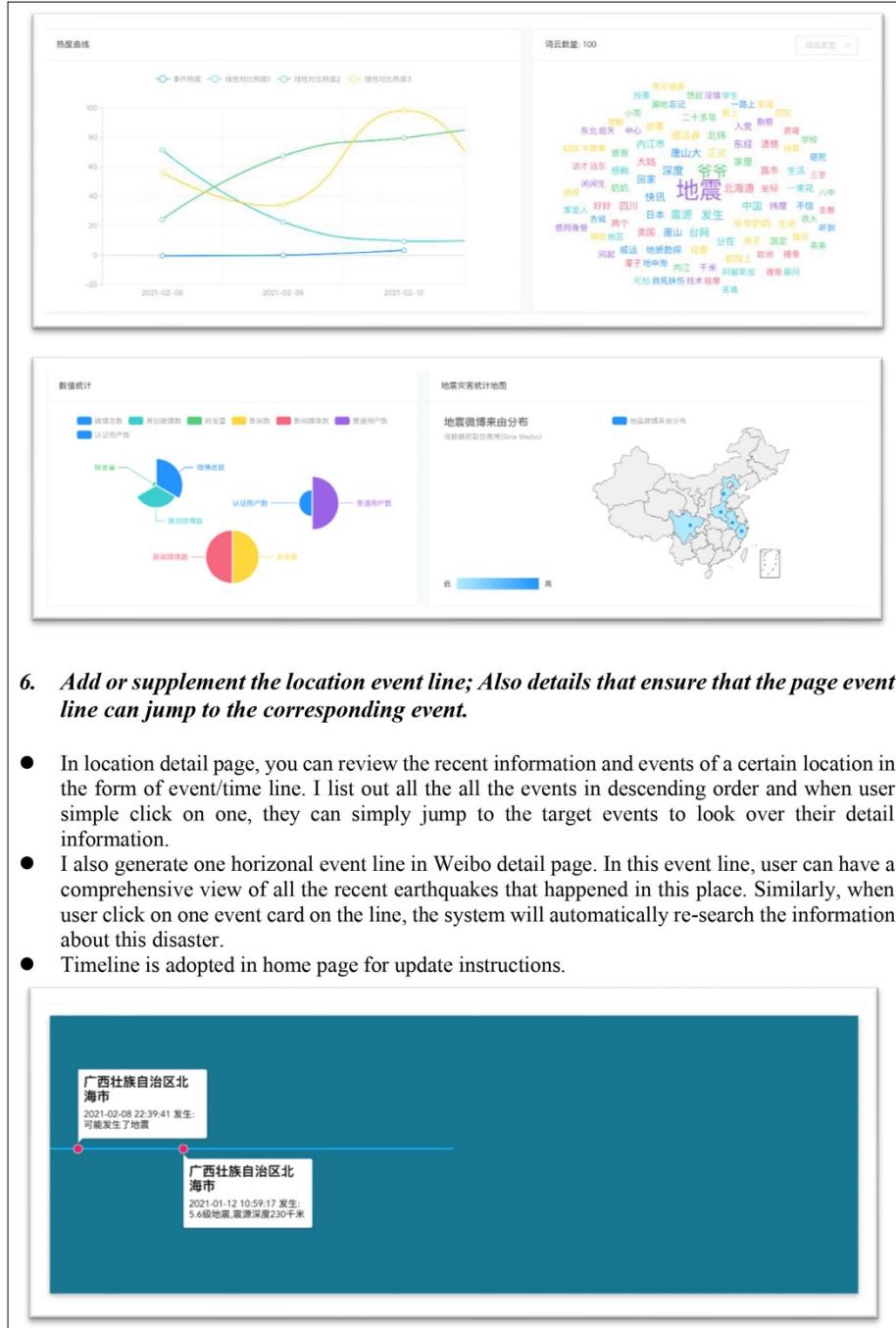
- Further, based on this successful deployment, I will extend the data source dimension to more pages' components like graphs or charts, and provide user with options to select their willing kinds of media. (Two kind of media list can be seemed below)



5. Complete the specific earthquake tracking, including the details of a single earthquake and the corresponding location and event.

- Weibo Detail page is designed for the purpose of tracking specific earthquake. Here, you can view the detail information of a single earthquake based on its Weibo/News data information.
- For instances, we have announced the location information of certain earthquake, including province, city and area. To track on a specific earthquake disaster, user can view on the heat line chart to recognize its intensity of discussion. We dig out the relevant cloud words and classify the constitute of our statistical information, including user distinguishment, reliability, verification. Also, we design the map to show their distribution and, in this case, user are able to speculate the original locality, or the most popular discussion.

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6. Add or supplement the location event line; Also details that ensure that the page event line can jump to the corresponding event.

- In location detail page, you can review the recent information and events of a certain location in the form of event/time line. I list out all the all the events in descending order and when user simple click on one, they can simply jump to the target events to look over their detail information.
- I also generate one horizontal event line in Weibo detail page. In this event line, user can have a comprehensive view of all the recent earthquakes that happened in this place. Similarly, when user click on one event card on the line, the system will automatically re-search the information about this disaster.
- Timeline is adopted in home page for update instructions.





**7. Complete the marker of Earthquake on map and showing of relevant information.
Complete the jump of map marking based on coordinates and improvement of map content.**

- The marker of earthquake can be seemed from the map label page. Each event is marked with a red marker; when user's mouse enters the marker, tooltip information will show up and later disappear when his mouse leaves.
- In this page, user is able to view the all latest/relevant earthquake events in the map of China. The marker of each event will show up with its province, city, area, and also the time that earthquake happens, its magnitude, and also how much times of earthquake that recent years had happened.
- Further I will equip this page with more disaster types/media types/ dimension of year. Also, even more sophisticate 3D map layer and markers will be used to better describe location and distribution information.



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尚需完成的任务 Work to do:

1. Complete the incremental realization of data from 2 years to 5 years, realize the diversification of data expression, and optimize the expression form and content accuracy of part.
2. Add user-related management functions, including various information management operations, user authorization management, etc.
3. Learn and import knowledge map and show relevance description, design linkage and skip functions for knowledge map.

存在问题 Problems:

1. The full name of CORS is Cross-Origin Resource Sharing, which means cross-domain Resource Sharing. A cross-domain request is made when a resource accesses a resource on a different domain name or on a different port from the same domain name. If at this point another resource does not allow cross-domain resource access, then that resource accessed will experience cross-domain problems.
2. JS as a front-end scripting language, both learning and practice are relatively little contact. However, when developing, I often miss some quick methods/organization methods, and instead use a more complex and simple way to write, which is easy to make the code jumbled and cumbersome.
3. In the selection of E-Charts and part of the selection of graphics, often there is a bad effect. For example, some Elements-UI colours are different; Some Plug-ins react slowly after being instantiated in Vue; For example, some markers and layers load too slowly when there is a lot of duplicate data. ESLint reports errors when packaging projects, plug-in/page change conflicts, etc. In short, the performances of pages may not live up to my expectation.

已采取的办法 Solutions:

1. To solve CORS, In the front-end I open the JS comment of vue.config.js. Indeed, the problem is that the access-Token is not allowed by the Headers. Therefore, the Backend configuration needs to add Access-Token release corresponding to Headers. Such problems indicate that the backend has set up unconventional fields that are not allowed to be customized, and the backend configures fields that are not allowed to be configured in Access-Control-Allow-Headers (taking Java as an example).
2. To solve question 2, I actively ask questions: I participated in some forums and discussion groups. If I have any questions, I will post them in the group/forum and usually get answers. Often this way I can learn a more convenient and efficient way to code, and then I will fill in my knowledge map. And I also accumulate records of good solution. By actively annotating the

Website for Natural Disaster Monitoring based on multiple social media

code, I am able to recall the same/similar situations in the future and find a good solution.
(Platform samples: Vue.js Website、CSDN、w3school、iMooc、CNBlog)

3. In all, I think some best ways that I have adopted to solve the question 3 are:
 - Don't be afraid to switch to new plugins/methods.
 - Learn and explore more and thus lead to better alternatives.
 - Communication can improve the efficiency of conveying overall group members' purposes. By increasing the frequency of pre-release/formal environment update, and communicating and feedback with team members, it has been proven to improve page quality and presentation.

北京邮电大学 本科毕业设计（论文）教师指导记录表

Project Supervision Log

学院 School	International School	专业 Programme	e-Commerce Engineering with Law							
姓 Family name	Liao	名 First Name	Jianxiang							
BUPT 学号 BUPT number	2017212938	QM 学号 QM number	171049114	班级 Class	2017215112					
论文题目 Project Title										
Date: 31-08-2020 Supervision type: online chatting Summary: discussed the project specification and summarize the last week's former work.										
Date: 03-09-2020 Supervision type: online video meeting Summary: discussed the project specification, wrote an online form about final project targets and standards										
Date: 06-09-2020 Supervision type: online chatting, group meeting Summary: discussed the draft specification and finish the draft; discussed the formal name of final project; supervisor revised draft and communicated goals										
Date: 07-09-2020 Supervision type: online chatting Summary: define main tasks and certain outcomes; discussed user sign in/log in functions. Discussed work allocation and assignment, stress communication with group members; received written feedback on the draft specification										
Date: 07-09-2020 Supervision type: online chatting Summary: define main tasks and certain outcomes; discussed user sign in/log in functions. Discussed work allocation and assignment, stress communication with group members;										
↓ Date: 08-09-2020 to 06-10-2020 Supervision type: online chatting, weekly group meeting, group testing and exhibition Summary: supervised development and discussed optimization in the lab. Group discussion with exhibition; gave valuable opinions and user experience about the website; bring useful and important idea about page arrangements;										
↓ Date: 10-10-2020 Supervision type: online chatting Summary: discussed the topic selection and supervisor allocation.										

Website for Natural Disaster Monitoring based on multiple social media

Date: 10-10-2020

Supervision type: online chatting, group meeting

Summary: discussed the topic selection and supervisor allocation.

Date: 12-10-2020

Supervision type: online chatting

Summary: received the message about topic selection; affirm and complete supervisor allocation.

Date: 19-10-2020

Supervision type: online chatting

Summary: discussed about time allocation; advised in spending more time on front-end work and final project; advised in updating the stable functions to project's formal environment; putting suggestions on map location and marker redirecting.

↓

Date: 20-10-2020 to 04-11-2020

Supervision type: weekly group meeting, group testing and exhibition

Summary: supervised development and discussed optimization in the lab. Group discussion with exhibition; gave valuable opinions and user experience about the website; discussed on deploying an online Mantis system to manage work assignment and BUG maintenance.

↓

Date: 12-11-2020

Supervision type: online chatting

Summary: encourage communication with group members; encourage on developing in Mantis-BT and finish the developing; try using the operation and maintenance system and give valuable opinions;

↓

Date: 12-11-2020 to 01-12-2020

Supervision type: weekly group meeting

Summary: supervised development and discussed optimization in the lab. Group discussion with exhibition; gave valuable opinions and user experience about the website;

↓

Date: 04-12-2020

Supervision type: online chatting, group meeting

Summary: suggested on writing a scheme about the disaster monitoring system; suggested on improving the user friendliness and reduce the simple list of data; giving valuable opinions about merging different kinds of media; suggest on giving direction and guidance on user functions;

Date: 08-12-2020

Supervision type: online chatting, group meeting

Summary: discussed on improving pages relevance; suggested on project optimization

Date: 08-12-2020

Supervision type: online chatting, group meeting

Summary: discussed on improving pages relevance; suggested on project optimization; discussed on new design on improving pages relatedness to become more like a system

Date: 04-01-2021

Supervision type: online chatting

Summary: discussed the draft with early-term report

Website for Natural Disaster Monitoring based on multiple social media

Date: 10-01-2021

Supervision type: online chatting

Summary: discussed the format and important aspect about project progression; revised and check the content of early-term report; gave suggestions on writing progression and design in new pages; advised on writing/developing the system in a more comprehensive perspective

Date: 17-01-2021

Supervision type: online chatting

Summary: suggested the main direction on development (refuse recommendation page); discussed the important progress on former pages' logic and jump; discussed on improving the inquire functions about certain locations' disaster effects; suggested on improving the logic on former pages;

Date: 27-01-2021

Supervision type: online chatting, online meeting

Summary: discussed about the present work of the project; suggested giving feedback and weekly report more frequently;

Date: 19-02-2021

Supervision type: online chatting

Summary: discussed the draft about mid-term report, and especially the PPT

Date: 23-02-2021

Supervision type: online chatting

Summary: discussed the draft about mid-term report, and provide former students' excellent work template about writing the report and slides;

Date: 24-02-2021

Supervision type: online chatting, online meeting

Summary: discussed the draft about mid-term report; supervise the PPT exhibition; discussed and gave valuable suggestions about the PPT; gave valuable opinions about how to revise PPT and improve the main logic of project expression; discussed about stressing the important aspects about the PPT and report;

Date: 26-02-2021

Supervision type: online chatting

Summary: finish revise the mid-term report; approved the final edition of the report;

Risk Assessment

Risk Description	Likelihood Level l_1	Consequence Level l_2	Combined Level $l_1 * l_2$	Action to Take
Sever crash because of overloading	3	2	6	Report and restart the sever
URL request failure because of network congestion	2	2	4	Refresh the page or change the network
Loss or damage of the online project source code	1	4	4	Back up the source code and project
Cyber hacking or sever attack	1	5	5	Sever & Code maintenance

Environmental Impact Assessment

Cost of manufacture: As an online system project, this project does not include any cost of manufacture.

Waste disposal and recycling: Our system is an online system and it does not involve any disposal or recycling.

Energy use in service: Our system occupies our sever memory with average of 2760.241MB. The detail information of our project resource occupancy could be seen in the following two pictures.

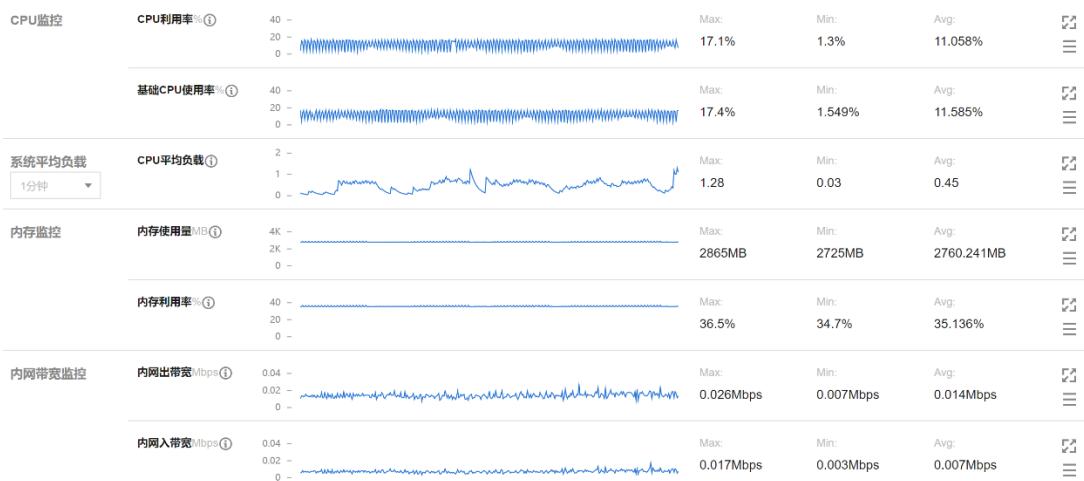


Figure 54 Usage of CPU and Memory

	Total	Used	Free	Shared	Buff/Cache	Available
Mem	7855	2475	1330	82	4048	4817
Swap	0	0	0	/	/	/

Figure 48 Relevant Information about Memory (MB)

Savings in energy: Actually, we don't have any plan to save the energy used in our system. But we believe in later time, we will simplify our pages and system plugins for energy saving by reducing the content loading.