SCHOOL OF COMPUTER SCIENCES
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CSE441/CPT441 SOFTWARE PROCESS AND QUALITY ASSURANCE

Assignment

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Catalog

1. Project Background

Goal of our project is to complete a visual map of regional disaster data. It mainly involves projects such as geography, modeling, and data crawler. Mainly subdivided into three system steps:

1. Geohazard visualization
2. Geohazard simulation with DEM in GIS
3. geohazard data crawler

The problems facing our group at the moment are modeling, learning of rendering techniques, and collection of geographic information. Because this is a brand new field, too much geographic information is involved. The technology of the computer is only the foundation responsible for completing the project. So facing a brand new technical challenge, we need to learn a lot to complete this project.

The main function of this project is: the user can obtain the disaster information in the region by querying the disaster situation in the region. Use this for the next activity the user needs this information for.

The partner in charge of the data crawler is strengthening the python crawler technology to obtain open source terrain information and disaster information. A partner in charge of geohazard visualization is learning how to 3d model, and render.

1.1 Problem background

The report entitled "The Cost of Disasters 2000-2019" was jointly released by the United Nations Office for Disaster Risk Reduction and the Disaster Epidemic Research Center of the University of Leuven in Belgium. People die, equivalent to nearly 60,000 people being killed by disasters every year on average, and the death rate due to disasters in poor countries is more than four times higher than that in rich countries.

At the same time, disasters in the past 20 years have caused global economic losses of US$2.97 trillion and affected a total of 4 billion people, many of whom were affected more than once.

In contrast, in the last 20 years in the world, that is, between 1980 and 1999, there were 4,212 natural disasters reported, 1.19 million people died, more than 3 billion people were affected, and the total economic loss was 1.63 trillion US dollars.

The report pointed out that the surge in the number of climate-related natural disasters is the most important reason for the increase in the total number of disasters. From 1980 to 1999, the number of climate-related disaster events reported globally was 3,656, compared with 6,681 from 2000 to 2019.

Statistics show that in the past 20 years, the number of global flood disasters has more than tripled from 1389 to 3254, accounting for 40% of the total number of disasters and affecting 1.65 million people. Followed by storm disasters, the number of occurrences rose from 1457 to 2034, accounting for 28% of the total number of disasters. In addition, droughts, wildfires, extreme temperatures, and natural disasters such as earthquakes and tsunamis have all increased significantly.

Mami Mizutori, head of the United Nations Office for Disaster Risk Reduction, said, "We are deliberately destroying. This is the only conclusion that can be drawn after looking at disaster occurrence data over the past 20 years. Political and corporate leaders have not yet aligned their actions with the global climate and environment. The reality is unified, and the new crown epidemic is only the latest evidence", "Despite scientific evidence that we are turning the only homeland we have into an uninhabitable purgatory for millions of people", countries continue to "sow their own Seeds of Destruction", which is really "incomprehensible".

Mami Mizutori said, “Although disaster control organizations have managed to save many lives through improved pre-disaster preparations and the hard work of staff and volunteers, the outlook for disaster reduction remains bleak, especially as industrialized countries are reducing greenhouse gas emissions. It performed extremely poorly.”

According to the report, from 2000 to 2019, there were 3,068 natural disasters in Asia, ranking first in the world, followed by 1,756 in the Americas and 1,192 in Africa.

In terms of affected countries, eight of the ten most disaster-affected countries in the world are located in Asia. Among them, China had a total of 577 disaster events, ranking first in the

Philippines (304) and Indonesia (278) ranked third to fifth. Most of these countries have large land areas, numerous geological types, and relatively high population densities in disaster-risk areas.

Data show that 2004, 2008 and 2010 were the three years with the most severe natural disasters in the past 20 years. In these three years, more than 200,000 people died of disasters worldwide.

Among them, the Indian Ocean tsunami in 2004 caused a total of 226,400 deaths, making it the most deadly disaster. This was followed by the magnitude 7 earthquake in Haiti in 2010, which killed an estimated 222,000 people and left millions homeless. Additionally, Cyclone Nargis in 2008 killed 138,000 people in Myanmar.

According to the report, since 2010, there has been no major natural disaster that has killed more than 100,000 people, and the global annual death toll due to disasters is less than 35,000.[1]

1.2 System overview

1.2.1 System objective

The main goal of the geological disaster system is to show people more vividly the disasters happening around the world, and use QGIS, blender and other software to model to simulate floods and landslides. In order to improve people's awareness of urgency, and provide those who often travel or go on business with some geological disaster data in the areas they will go to, so that they can make some preparations for possible disasters, thus saving their lives.

At the same time, it can also express the disasters that have occurred in the world in recent years with data, so as to tell people the changes that are happening in our world.

1.2.2 System module breakdown

1.2.2.1 Geohazard simulation with DEM in GIS

This subsystem focuses on 3D modelling, using QGIS's DEM to model the consequences of floods or landslides (or Blender as well). When the user clicks on an area that indicates that there has been a flood or landslide disaster, the user can understand the severity of the disaster by watching a 3D animation.

1.2.2.2 Geohazard data crawler

The system is the foundation of the project. Through the data crawler, the disaster data is collected, the data is collected through python, put into the database, and the subsequent modeling and rendering require these data to complete the basic information of the system.

1.2.2.3 Geohazard visualization

The subsystem directly tells the user the danger level of the disaster through 3D visualization. When users want to know and click on the flood or landslide situation in this place, they will use 3D modeling and 3D animation, which is close to restoring the real situation to tell users the danger of these disasters instead of text and pictures.

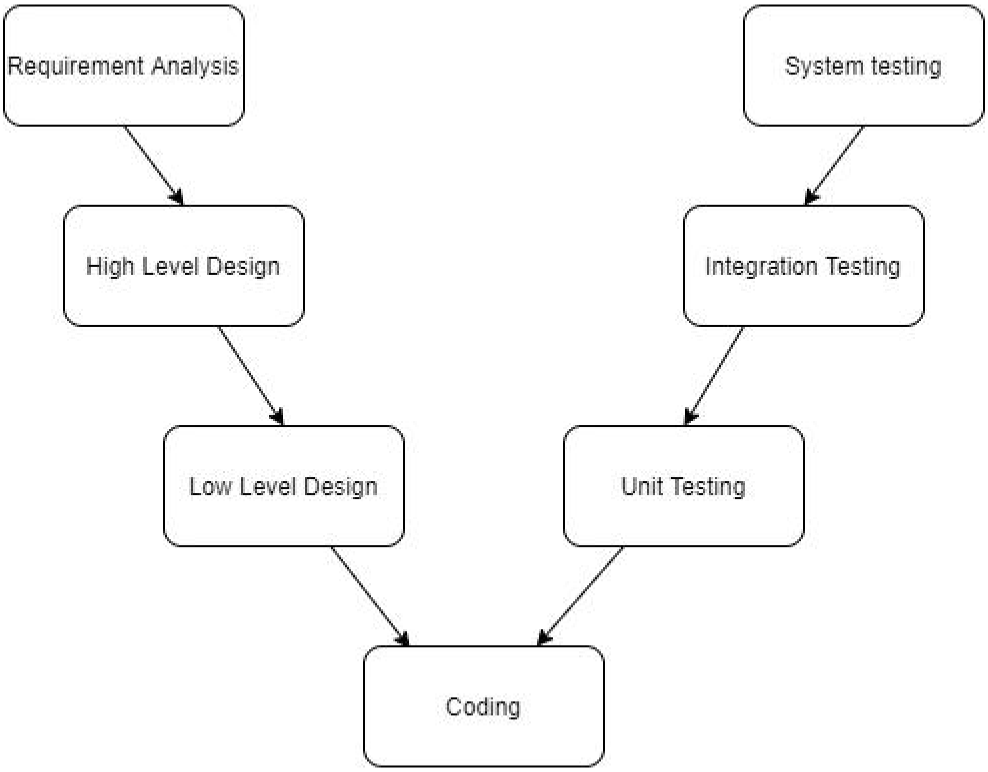
1.2.3 System description and function

The Geohazard System mainly integrates the floods and landslides that have occurred in various regions and uses a more vivid 3D animation to express the severity of the disaster. Remind those who want to travel to a certain area to pay attention to these two kinds of disasters, or let the government consider these two kinds of natural disasters in advance before planning the city construction, so as to avoid large economic losses and damages when these two kinds of natural disasters come. casualties.

Geohazard System allows users to analyze and edit spatial information.

In the background, the internal personnel can input the geological hazard data into the system in real time and store it in the database.
The system should allow users to visualize geohazards occurring in designated areas.

2. Software Process Model



V-model:
Because the requirements of our Final Year Project are collected at the beginning, it is convenient for us to start making plans for development, but as the first large-scale project we develop, we may need a lot of testing and verification to increase the project. reliability. And compared with other models, the V model is not too difficult to manage, and it is also easy to understand.
3. Software Requirements Specifications

3.1 System requirements

	PC	**MAC**
Operating System	Windows 7 or higher	Mac OS x 10.3 or higher
Processor	2.8 GHz	3.2 GHz
Ram	2 GB +	2 GB +
Video Card	GTX 660	4 G
Browser	Firefox 1.1+, IE 7.0+, Google Chrome	Firefox 1.1+, IE 7.0+, Google Chrome
Broadband Connection	1+ Mbps	1+ Mbps
Additional Software	Adobe Flash Player	Adobe Flash Player

	10.0.22+ Plug-in	10.0.22+ Plug-in

3.1.1 Functional requirements

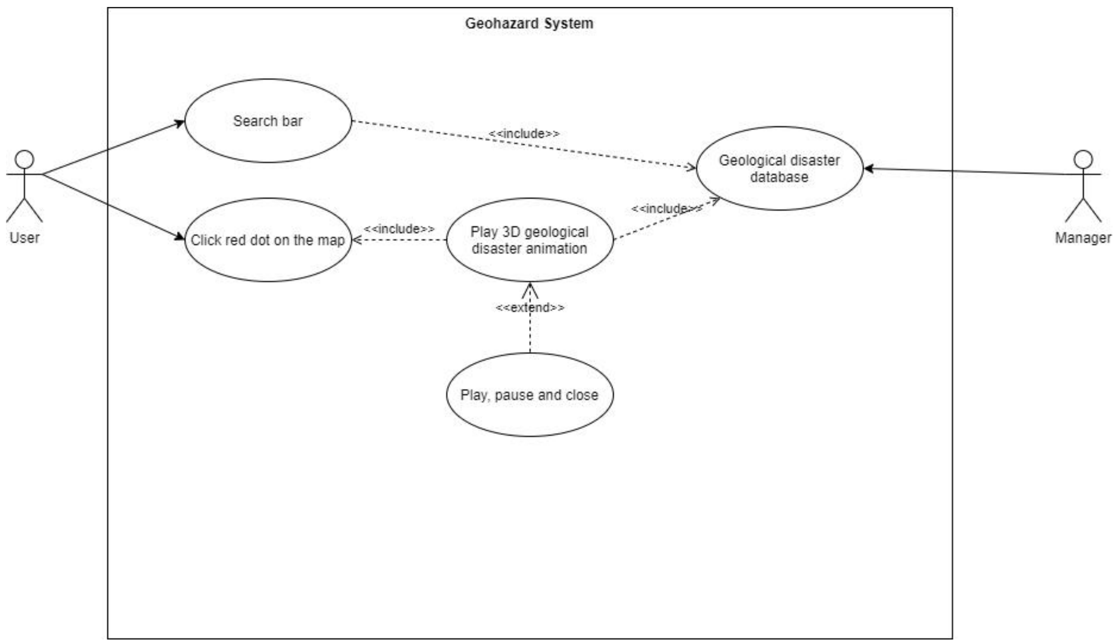
Users can view 3D images of geological disasters by clicking on the red dots.
Users can play or pause the video.
Users can play multiple geological disaster images at the same time.

3.1.2 Non-functional requirements

Most users can't wait more than 3 seconds after opening the image.
The red dot should be eye-catching and allow users to clearly identify which region they are in.
Image switches should be clearly visible.

3.2 Use case modelling

3.2.1 Use case diagram



3.2.2 Use case descriptions

Use case name	Search bar
Scenario	Search area
Triggering event	The user clicks on the search bar and wants to search for a

	region	
Brief description	After the user enters the area they want to view in the search bar, the map will automatically guide to the local area.	
Actors	User	
Related use cases	-----	
Stakeholders	User, Manager	
Preconditions	The region entered by the user must exist in the database	
Postconditions	The map leads to the local area	
Flow of activities	User	System
	1. Enter a region that does not exist. 2. Enter the wrong format (such as only numbers or only local zip codes, etc.) 3. Enter the local address.	1.1 Check the database 2.1 The prompt information is wrong 3.1 Map guide to local area
Exception conditions	Website crashes	

Use case name	Click red dot on the map	
Scenario	Click red dot on the map	
Triggering event	After the user selects a region, he clicks the red dot in the region	
Brief description	Users can click on the red dots to view 3D animations about local geological hazards that exist in the geological hazard data	
Actors	User	
Related use cases	-----	
Stakeholders	User, Manager	
Preconditions	The user's network condition must be good.	
Postconditions	Play the local geological disaster situation simulated by Blender.	
Flow of activities	User	System
	1. User right mouse click 2. User left mouse click 3. The user's network condition is very poor	1.1 The system does not receive the signal to play animation 2.1 The system retrieves information from the geological disaster database, and then plays 3.1 The user's signal cannot be transmitted to the system, and the system does not respond.
Exception conditions	1. Website Crashes 2. Mismatch between geological hazard data and local	

	information (out of sequence)

4. Requirement Traceability Matrix

Requirement ID	**Design Artefacts**	**Source Code**	**Tests**	**Deps**
A0.1 Simulated flood	Play flood 3D animation	Flood.blend	FloodAnmationtest.testSave	D0.1
B0.1 Import map data	Modeling based on terrain data	Mapdata.dem	Maptest.testSave	A0.1
C0.1 Building Trees and Houses Using Blender	Simulate the scene of being washed out	items.blend	Itemstest.testSave	A0.1
D0.1	Play an animation on the map	FloodOnMap.qgz	PlayOnMaptest.testSave	

5. Software Metrics

5.1 Product metrics

Product metrics	Description
usability	There should be no more than 7 buttons on the user interface.
maintainability	Immediately after the data is maliciously changed, the transfer of the database will be interrupted and the map display will be turned off.
accuracy	The accuracy of the data should be one hundred percent

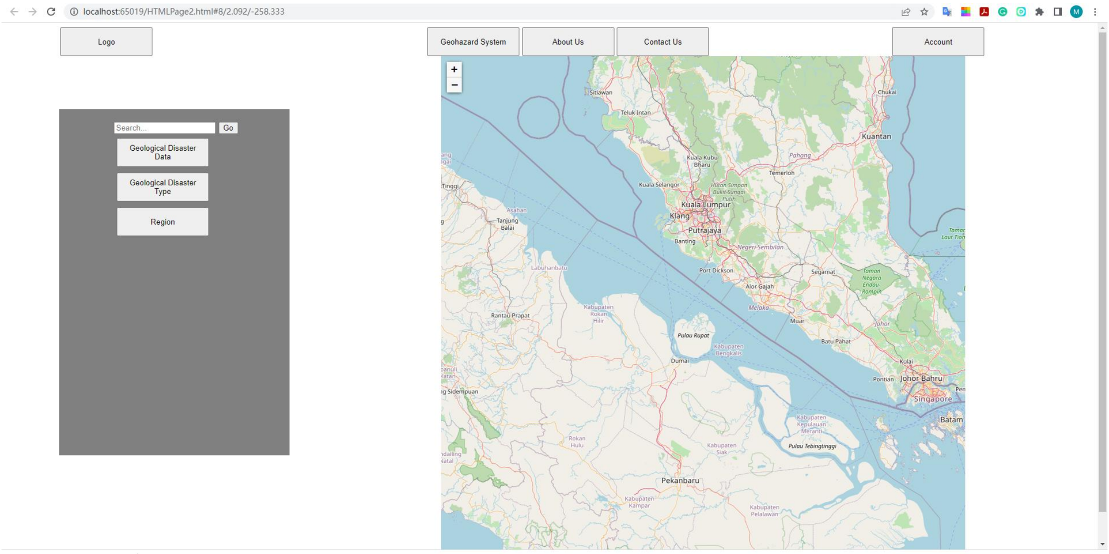
5.2 Project metrics

Minimize the development time	Make a development plan and follow it strictly.At the same time, search the development experience of geological disaster software on the Internet.
Improve cost estimation	Constantly compare the functions i am making with existing products, and then optimize them.

5.3 Process metrics

Overall development time	Overall development time takes at least 2 months
Type of methodology used	Since the module is developed by a single person and does not communicate with users, I think the waterfall model is more convenient.

6. System Screen Shots



7. GitHub Screen Shots

8. Conclusion and future work

Generally speaking, in Milestone 1, our code part progressed slowly, mainly focusing on requirements analysis and software design. But this is also the most important step, because for us this is the direction we will continue to work on in the next six months. Future work should focus on coding and modeling, especially modeling, simulating scenarios of geological disasters, which is our main function and content. We mainly use Blender combined with QGIS for modeling, which will be a long learning journey.

Reference:

[1]: Humen Cost Of Disaters. - Centre for Research on the Epidemiology of Disasters United Nations Office for Disaster Risk Reduction