RASD DOCUMENT

IDK

Marco Ambrosanio

Amirhossein Donyadidegan

Alessandro Violi

Hangyun Wang

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1. INTRODUCTION

Background

In recent years, advancements in data analysis techniques have greatly enhanced the comprehensive assessment of landslide and flood hazards. Given the paramount importance of ensuring the safety of residents and tourists, monitoring the disaster risk level of venues for large-scale events has become increasingly critical. Our project specifically focuses on Italy, the host country of XXV Winter Olympic Games, the Italy, which are popular tourist destinations. Italy's diverse topography and complex environmental composition make many regions prone to landslides and floods. Certain areas, such as Milan with its Seveso River overflows or Valtellina's Ruinon landslide, have experienced severe events that have had significant impacts on residents.

Purpose

Our project aims to address the safety concerns surrounding locations hosting events for the XXV Winter Olympic Games, which are prominent tourist destinations. Given the susceptibility of these cities to landslides and flooding, particularly during the winter months, it is crucial to provide authorities and tourists with accurate and timely hazard assessments. By leveraging advancements in data analysis and visualization techniques, our project seeks to empower stakeholders to make informed decisions regarding safety measures and risk mitigation strategies. Ultimately, the goal is to enhance the safety and well-being of residents and tourists during the Olympic Games and beyond.

Scope

Our project's scope encompasses the development of a user-friendly web application designed to assess the safety of locations hosting events for the XXV Winter Olympic Games, particularly for tourists and community members. This application will enable users to access, process, and visualize data and maps related to hazard risks in these areas. By providing interactive maps, historical data analysis, and notification systems, the app aims to enhance user awareness of potential risks and assist in making informed decisions regarding safety measures. The project will utilize data from the IdroGeo API to analyze various hazard indicators and visualize them.

2. USER CHARACTERISTICS

Based on our predictions, users of the application can be categorized into two main groups: Non-login users and Login users.

Non-login users:

- Non-login users, including everyone who access our application without registering or logging in. Such as tourists and event attendees, may use the application for trip planning and decision-making.

- They rely on environmental analysis and hazard predictions to ensure their safety during visits to areas prone to landslides and floods.

- Non-login users seek information on potential hazards and vulnerabilities to make informed choices about their activities and routes.

Login users:

- Login users, such as emergency responders, researchers, and urban planners, utilize the application for in-depth analysis and risk assessment.

- They leverage advanced predictive capabilities and detailed hazard data to develop comprehensive emergency response plans.

- Login users identify and assess potential hazards and vulnerabilities at a granular level, contributing to the development of strategies to mitigate risks and enhance resilience to natural disasters.

By distinguishing between Non-login users and Login users, we highlight the different needs and objectives of these user groups when interacting with the application.

User Story

Story 1 — Query landslide/flood data to plan travel

As a traveller, I want to query landslide/flood information of my destination (location), so that I can adjust my plans accordingly and ensure a safe journey.

Story 2 — Develop emergency response plan

As an emergency response expert,I want to track detailed hazard data,so that I can develop emergency response plans effectively.

Story 3 — Utilize landslide/flood data for urban planning

As a city planner, I want to utilize historical flood and landslide data, so that I can incorporate risk mitigation measures into urban development plans.

3. USE CASES

Actors:

1. **Non Logged In User**: This actor represents a user who has not logged into the system.
2. **Logged In User**: This actor represents a user who has successfully logged into the system.

Use Cases for Non Logged In User:

1. **Access to Interactive Map**: The non-logged-in user can view and interact with a map that displays various geographical data points.

Use Cases for Logged In User:

1. **Access to Interactive Map**: The logged-in user has the same access to the interactive map as the non-logged-in user.
2. **Query Data**: The logged-in user can also perform queries on the available data, similar to the non-logged-in user.
3. **Data Manipulation and Analysis**: The logged-in user can manipulate and analyze the data. This includes operations like filtering, sorting, and performing advanced data analytics to derive insights from the dataset.

Diagram Representation
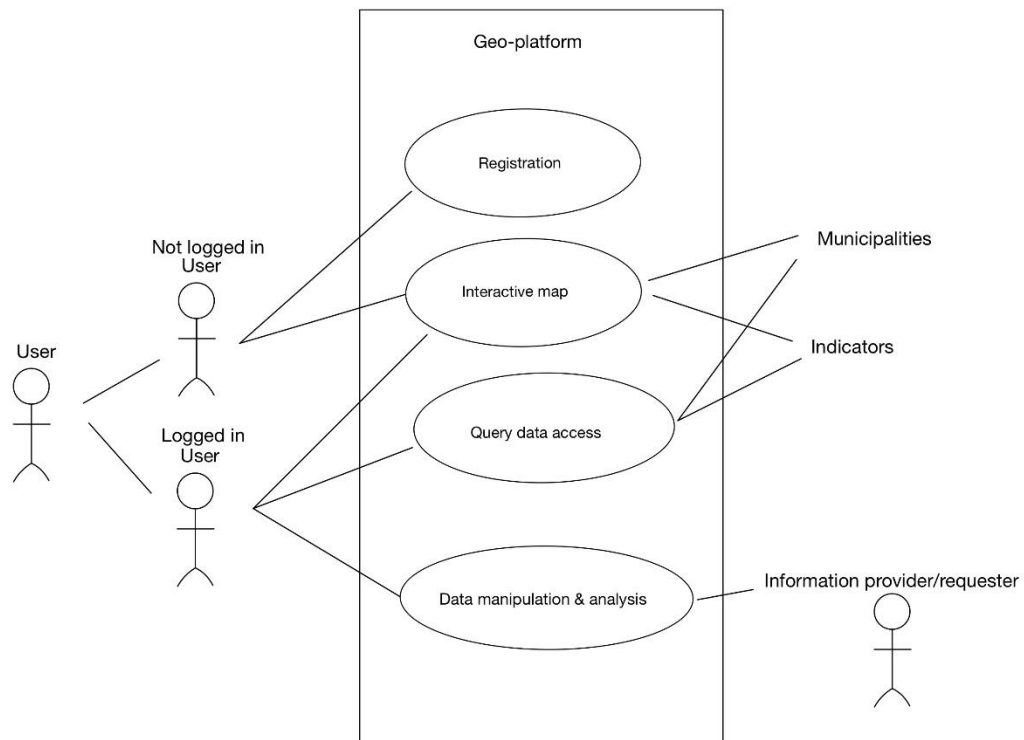
4. REQUIREMENTS

Functional Requirements

The functional requirements of the system are categorized based on user roles, namely Non-login Users and login Users, to cater to their specific needs and capabilities:

For Non-login Users:

1. Visualization of Map:

    • Utilize a map

For Login Users:

1. Data Querying:

    • Provide Data query functionalities for users to conduct in-depth analyses of hazard data.

    • Enable user to create specific queries by combining various types of hazard-related information from the database.

2. Detailed Data Display:

    • Present hazard data with detailed indicators and attributes for users to perform comprehensive analyses.

3. Data Download:

    • Allow users to download data of hazard indicators for further analysis or documentation purposes.

By incorporating these functional requirements, the system will effectively support users in assessing and responding to landslide and flood hazards in areas hosting the Winter Olympic Games.

Non-functional Requirements

1. **Performance**:

    • Response time for data queries and visualization tasks should be less than 5 seconds to enhance user experience.

    • The system should be capable of handling concurrent user access and maintaining performance during peak usage periods.

2. **Security**:

    • User authentication and authorization mechanisms should be enforced to control access to sensitive data and features within the application.

- Data encryption techniques should be employed to protect user privacy and ensure the confidentiality of information transmitted over the network.

3. **Reliability**:

- The system should be highly available, with minimal downtime for maintenance or updates, to ensure uninterrupted access for users.

- Fault tolerance mechanisms should be implemented to mitigate the impact of system failures and ensure data integrity and consistency.

4. **Scalability**:

- The system should be designed to accommodate potential growth in data volume and user traffic, ensuring scalability to meet future demands.

5. **Usability**:

- The user interface should be intuitive and user-friendly, with clear navigation and easily understandable visualizations to facilitate data exploration and analysis.

6. **Maintainability**:

- The codebase should be modular and well-structured to facilitate future maintenance, updates, and enhancements to the application.

- Comprehensive documentation, including system architecture and user guides, should be provided to support developers, administrators, and end-users in understanding and maintaining the software.

5. SYSTEM MODEL

Activity Diagram
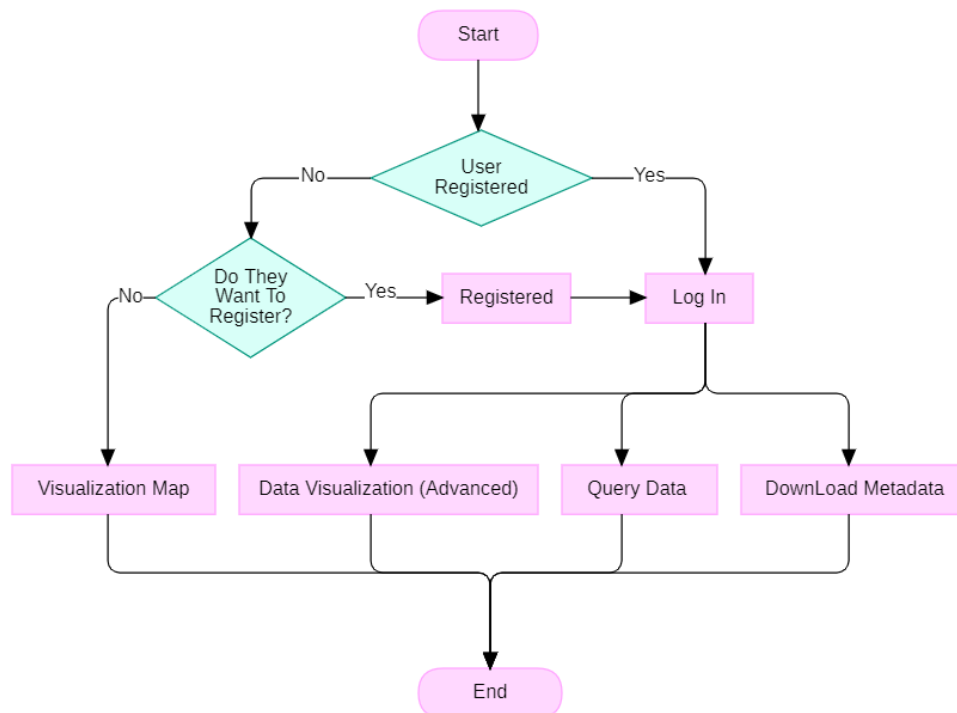
The process begins with users having the option to either register or proceed without registering. If already registered, users can log in; otherwise, they can continue with limited access.

Query Data

This functionality enables both Non-login User and Login User to retrieve specific data:

- Surface areas prone to flood risk
- Buildings susceptible to flood damage
- Surface areas vulnerable to landslides
- Buildings at risk of landslides

Login User (e.g., civil protection, requiring login) can access additional data:

- Population residing in flood-prone areas
- Population at risk of landslides
- Local business units facing flood risks
- Local business units vulnerable to landslides
- Cultural heritage sites at risk of landslides
- Cultural heritage sites vulnerable to floods
- Families at risk of landslides
- Families at risk of floods

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Users must provide the following information to retrieve desired data:

- Region name
- Province name
- Municipality name

Geographic Visualization

This functionality enables both Non-login User and Login User to visualize data geographically and make spatial measurements directly on the interactive map.

If users are registered, they gain access to additional functionalities upon logging in:

Data Manipulation & Analysis:

This feature empowers users to manipulate data, conduct analyses, and report new accidents, including:

- Creating specific queries with the option of leveraging data present in the database by combining various types of information.

- Displaying data through thematic maps or charts.

- Viewing the metadata of the indicators used.

After performing any operations, the user can choose to end the process.