Software Requirements Specification Template

CS 258 Software Engineering

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3D Modelling of Debris Flow Simulation

Software Requirements Specification

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# Revision History

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# Document Approval

The following Software Requirements Specification has been accepted and approved by the following:

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| --- | --- | --- | --- |
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# 1. Introduction

## 1.1 Purpose

The purpose of this document is the detailed presentation of a Debris Flow Simulator. The document explains the purpose and features of the system, what it will do and the constraints under which it must operate.

## 1.2 Scope

The software system produces a landslide simulator. This system helps to analyze the effect of a landslides over a particular area given suitable inputs. The system actually takes the map of the area, initial landslide thickness map, soil density as input and present the simulation of the landslide as the output thus predicting and analyzing the effect of the landslide, in terms of velocity and thickness of soil.

## 1.3 Definitions, Acronyms, and Abbreviations

DEM(Digital Elevation Map)- This is actually the 3D representation of a terrain’s surface. When we filter out non-ground points like bridges, roads, vegetation and other man-made features from the map of a place, we get a smooth elevation map called DEM.

Landslide Thickness Map - This is the map that includes the initial thickness of the landslide part at each point in the area provided under map.

Fluid Distance Map - This map consists of the height of the fluidized part at each point in the area provided under map. This map along with the Landslide Thickness Map helps to differentiate the part of soil that flows in the landslide and the part that remains as Solid part.

Rheology – Rheology is the study of the flow of matter, primarily in a liquid state, but also as "soft solids" or solids under conditions in which they respond with plastic flow rather than deforming elastically in response to an applied force.

## 1.4 References

[1] IEEE. IEEE Std 830-1998 IEEE Recommended Practice for Software Requirements Specifications. IEEE Computer Society, 1998.

[2] Beguería, S., Van Asch, T.W.J., Malet, J.P. & Gröndahl S. (2009): A GIS based numerical model for simulating the kinematics of mud and debris flows over complex terrain', Natural Hazards and Earth System Sciences 9, 1897-1909.

## [3] Beguería S. (2009) massmov2d: A numerical model for mass movements over complex topography, doi:10.5281/zenodo.930061.

## 1.5 Overview

# The following section includes the overview of the functionality of the system. It describes the requirements for the completion of the product. The section following to that includes a much technical orientation dealing with technical aspect of the functionalities of the system.

# 2. General Description

## Every time a landslide occurs, it creates a mass devastation to the areas around the center of the incident. The landslide of Uttarakhand and Kataropi are examples to such incident. The product helps to analyze the effect of a landslide under a region under certain circumstances such that proper precaution could be taken to prevent the area under danger zone.

## 2.1 Product Perspective

*This subsection of the SRS puts the product into perspective with other related products or*

*projects. (See the IEEE Guide to SRS for more details).*

## 2.2 Product Functions

The product takes DEM, initial Landslide Thickness Map, Fluid distance map, and the rheology as input from the user. It further processes the value and build the landslide simulation over the area based on the input.

## 2.3 User Characteristics

The user should know: -

1. How to operate a computer.
2. About different map file

## 2.4 General Constraints

1. Knowledge about DEM files.

2. Knowledge about different types of landslides and their corresponding values for rheology and landslide thickness.

## 2.5 Assumptions and Dependencies

Assumptions:

1. Python 3.6 or 2.7 available
2. Pcaster installed on the computer
3. Map files need to be provided

Dependencies:

1. Pcraster
2. Python 2.7 or 3.6

# 3. Specific Requirements

## 3.1 External Interface Requirements

### 3.1.1 User Interfaces

Windows/Linux

### 3.1.2 Hardware Interfaces

None

### 3.1.3 Software Interfaces

1. Sublime Text

2. Command Prompt/ Terminal

3. Pcraster

### 3.1.4 Communications Interfaces

None

## 3.2 Functional Requirements

The software project runs on Pcraster script. The functionality is discussed below.

### 3.2.1 Simulation

3.2.1.1 Introduction

The software simulates the landslide in a particular region based on the map

Of the region and initial condition provided.

3.2.1.2 Inputs

DEM file for the region, Initial Landslide Thickness Map File, Rheology of

the region

3.2.1.3 Processing

The software solves the differential equation based on initial conditions

provided

3.2.1.4 Outputs

The simulation of the landslide showing the effect that it causes

3.2.1.5 Error Handling

To be found.

## 3.4 Non-Functional Requirements

The software does not contain any databases to handle. Since the software takes input from user and processes them the performance time will not be a bothering issue. It can be reliable and may be used on any system with pcraster supporting in it.

## 3.5 Inverse Requirements

None till now

## 3.6 Design Constraints

None till now

## 3.7 Logical Database Requirements

No database is required in the system.