Software Requirements Specification

for

Unstable Bluff

Version 1.0 approved

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CS250

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Table of Contents

Revision History

Name	Date	Reason For Changes	Version
Coastal Bluff Erosion Detection adopted	9/21/22		1.0

1. Introduction

1.1 Purpose

This software system is responsible for detecting bluff erosion and reporting it to relevant authorities throughout a 300-foot stretch of the Del Mar, San Diego coastal area.

1.2 Intended Audience

This SRS is intended for the project managers, developers, and users. Project managers should focus on to sections one and two; developers should focus on sections five and six while referencing section three; and users should focus on sections one, five, and six.

1.3 Product Scope

This software is purposed to ensure the safety of beachgoers and railroad users at risk to the erosion of unstable bluffs in this area. The objective is to build a system that automatically monitors dangerous bluffs which in turn, helps authorized personnel do their jobs of managing appropriate safety measures and executing emergency evacuations as the system notifies these departments. The goal is for pedestrians and railroad companies affected by these hazardous bluffs to be notified of and kept away from anticipated collapses and slides from these bluffs.

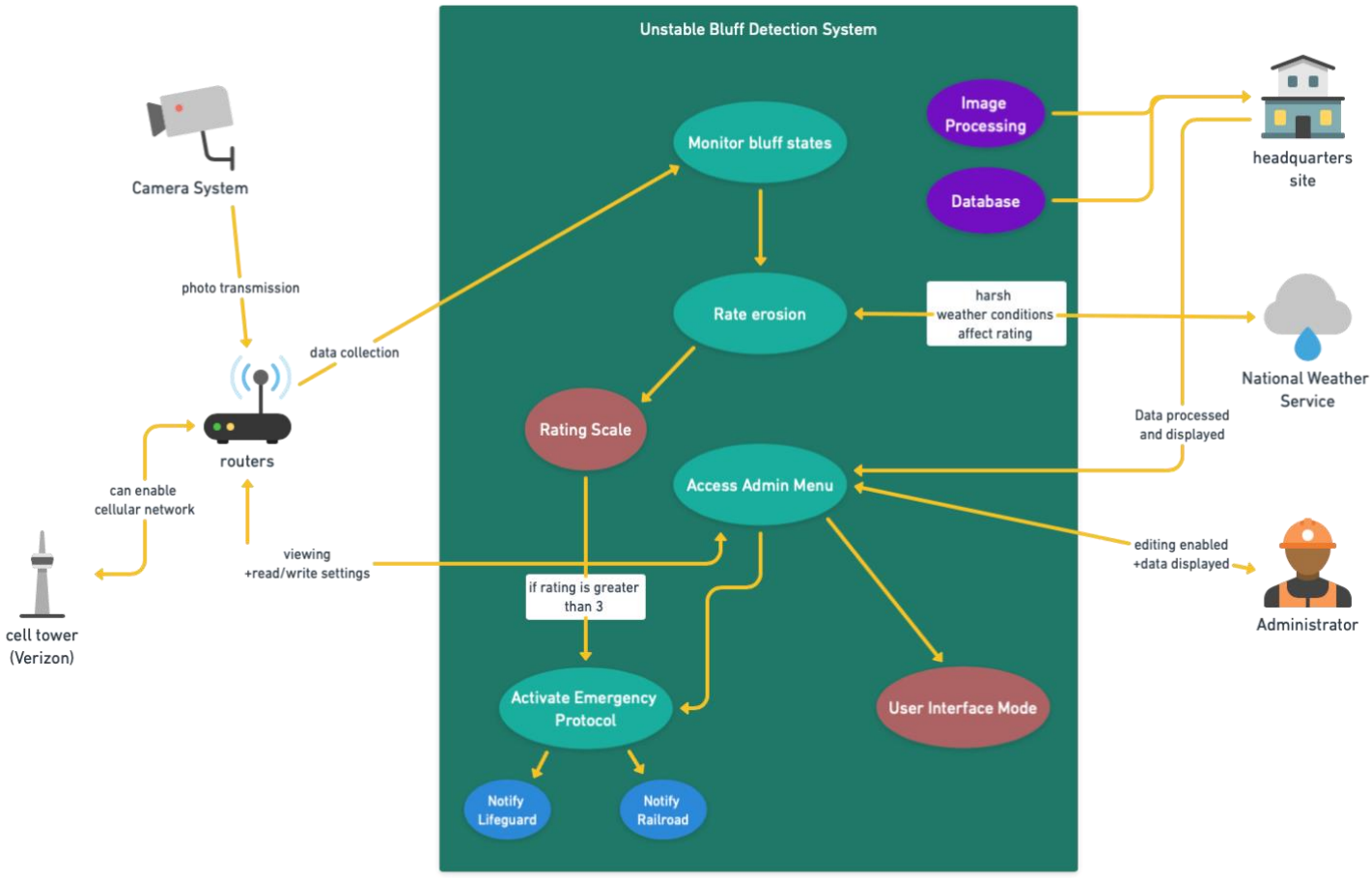
2. Overall Description

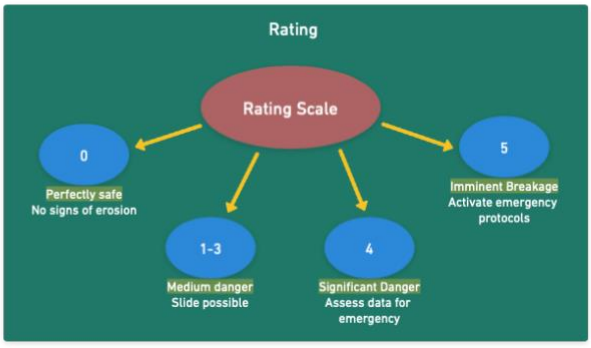
2.1 Product Functions

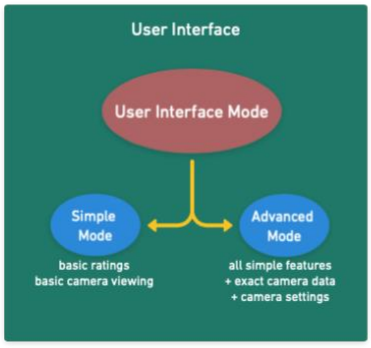
The major functions that the product must perform are as follows

- Monitor the state of bluffs
- Rate the erosion of bluffs
- Access the admin menu
- Activate emergency protocol

2.2 Unit-Case Diagram







3. Hardware

3.1 Hardware Requirements

Six cameras will be used to monitor the changes of the bluffs. These cameras will be Wi-Fi and cellular enabled, run on an interval timer, and support night vision, color or greyscale. Each will capture a 50x50ft view of the top edge of a bluff. They will be time-stamped and have GPS location of the photos taken.

There will also be wireless routers for each camera to create a network of connectivity from each camera to the main building.

The section of the system maintained in the main building will consist of a server system capable of storing a month of data at a time, and a computer with an AI image processing algorithm to help with rating.

The system will be accessed by administrators through a Windows 11, Intel Core-i7, 32GB RAM PC connected to the router network via Cat 9 ethernet with basic wired mouse and keyboard.

4. User Requirements

4.1 Simple Mode

The data received from the camera networks is compiled into the image processing program and the rating from that program execution is displayed for each of the bluffs. Along with the rating there is a current view of the bluff from a same day color photo.

4.2 Advanced Mode

Has all features of “Simple Mode” with the added functionality of viewing the in-depth data from each picture including all capture modes, month-long series of photos, and ability to change settings and the interval timer for each camera. Photos are listed under links captioned by their timestamps and camera GPS locations and are searchable in a search box.

4.3 User Interface Requirements

The user interface is sectioned by a log-in page and a User Interface Modes page with a subsection to log-in being a password retrieval request link (API) and a subsection to User Interface Modes being the search menu (API), camera settings, and the alert system (API).

The hardware requirements to access and navigate through the user interface are as follows: Intel Core i3 1.3GHz processor or greater, 4GB RAM or greater, 64GB HHD or SSD storage or greater, and a 2GB GPU or more.

5. System Features

5.1 Image Processing

5.1.1 Description

This feature uses data from the network of cameras to determine a measure of change on a day-to-day interval using existing AI image processing algorithms.

5.1.2 Functional Requirements

The functional requirements needed to satisfy the execution of this program for all the camera contents are 8 MP images or greater for processing, a Core-i5 2.1 GHz processor or greater, and 16GB RAM or greater.

5.2 Rating

5.2.1 Description

The rating system is built on a zero to five (0-5) scale with zero being a healthy bluff that is perfectly safe and a five being an imminent slide or collapse of a bluff. A one to three (1-3) on the scale means that a slide is possible, but not of significant concern and a four (4) is significant danger and requires the further assessment of administration to determine if a manual alert trigger is necessary. Each bluff along the covered range of the system is given a rating each day which can change based on new data.

5.2.2 Functional Requirements

The functional requirements needed are the same as listed in section 5.1.2

5.3 Alert System

5.3.1 Description

This feature depends on either the manual action of an administrator from the main computer or an automatic trigger protocol when a bluff is rated with a five (5) by the system at any given time. The alert sends out a WEA (Wireless Emergency Alert) to all railroad companies that utilize the coastal rail line, San Diego PD, the San Diego Fire-Rescue Department, and all Del Mar residents via SMS.

5.3.2 Stimulus/Response Sequences

For manual activation an administrator will log-in to the central computer to first reach an administrator menu. From there, they will select the “advanced mode” user-interface. Upon inspection of camera read-outs and timestamps, if a bluff rated at four (4) is deemed

actionable by inspection, the user will enter in a 15-character password (specified by site director) to activate the alert system.

5.3.3 Functional Requirements

The functional requirements needed to satisfy the alert system are the same as those listed in section 5.1.2 but include the requirement of getting IPAWS Governance clearance to install and use their software in this system's alert feature.

6. Nonfunctional Features

6.1 Connectivity

Routers are situated within 100ft of each other along the bluffs. These routers are capable of cellular connection to local Verizon cell towers for more remote connectivity between future additional routers and sites.

The alert system also requires a connection to these Verizon cell towers at all times for the execution of WEA alerts.