Safe Path Recommender

Project Team

Noman Siddique 19P-1664
Hifza Majeed 19P-1652

Session 2019-2023

Supervised by

Mr Usama Musharaf

Department of Computer Science

National University of Computer and Emerging Sciences
Peshawar, Pakistan

May, 2023

Student's Declaration

We declare that this project titled "*Safe Path Recommender*", submitted as requirement for the award of degree of Bachelors in Software Engineering, does not contain any material previously submitted for a degree in any university; and that to the best of our knowledge, it does not contain any materials previously published or written by another person except where due reference is made in the text.

We understand that the management of Department of Computer Science, National University of Computer and Emerging Sciences, has a zero tolerance policy towards plagiarism. Therefore, We, as authors of the above-mentioned thesis, solemnly declare that no portion of our thesis has been plagiarized and any material used in the thesis from other sources is properly referenced.

We further understand that if we are found guilty of any form of plagiarism in the thesis work even after graduation, the University reserves the right to revoke our BS degree.

Noman Siddique Signature: _____

Hifza Majeed Signature: _____

Verified by Plagiarism Cell Officer

Dated:

Certificate of Approval

The Department of Computer Science, National University of Computer and Emerging Sciences, accepts this thesis titled *Safe Path Recommender*, submitted by Noman Siddique (19P-1664), and Hifza Majeed (19P-1652), in its current form, and it is satisfying the dissertation requirements for the award of Bachelors Degree in Software Engineering.

Supervisor

Mr Usama Musharaf Signature: _____

_____

Mr Zeeshan Khan

FYP Coordinator
National University of Computer and Emerging Sciences, Peshawar

_____

Dr Hafeez ur Rehman

HoD of Department of Computer Science
National University of Computer and Emerging Sciences

Acknowledgements

In the name of Allah (SWT), the Most Gracious and the Most Merciful, the Exalted, we are going to start a project that will be beneficial for everyone. Every member of our family was a source of motivation during this whole process of the project. We would not be here if it were not for their love and support, next to the reverence of Allah. We will be always thankful to them for scarifying the time, attention, and other resources for us. We would like to express our great appreciation to Mr. Usama Musharaf for supervising our project and always helping us throughout this FYP tenure. He always supported and backed us up during tough and challenging situations and gave us his precious time whenever we asked. We are greatly indebted to Mr. Zeeshan, who generously donated his time to guide us at every single step of this project. In the end, we would again thank all the people mentioned and we hope to make you all proud of us in the coming future Insha'Allah.

Noman Siddique

Hifza Majeed

Abstract

There are some major mapping services provided by google, apple, etc they provide services like the shortest path between points but no one really focuses on safety-like services. This application will be of great importance in providing safety-like services. The system will suggest a safe path between the source and the destination. The safe path will be based on the precalculation of the crime score of the path. We will apply an Unsupervised Machine Learning Algorithm K-means clustering to find the danger index of the many possible paths between two places. There will be three possible routes between the points which will be marked with color to indicate the safety or danger. Our system also aims to suggest safe and liveable areas to buy houses or property.

Contents

List of Figures

List of Tables

Chapter 1

Introduction

Shortest path computation has been studied extensively. However, in some scenarios, the desired path may not be the shortest one. In hazardous environments, it can be life critical to minimize the distance traveled in unsafe regions for example a person who drives a long distance through the desert may try to travel via villages (“safe zones”) in the desert because a breakdown in an unpopulated region can be life-threatening. So there is a need for a system that can calculate and suggest a safe path between points so that the traveler can travel safely. The Safe Path Recommender is the application that will suggest the user paths between the source and destination that will be colored in different colors to indicate whether the route is safe to travel or not these suggestions will be made according to the past crimes score of that area or path. Moreover, our application will suggest safe and liveable areas for property and houses.

Chapter 2

Review of Literature

The safety of humans remain a concern in the past decade but now this concern is increasing and steps and measures are being taken to avoid any unpleasant event. Likewise, road safety is one of the most important concerns according to reports from more than 46000 people who die on in road accidents many get robbed and humiliated so many of the services are actually started in different countries to take over these issues like "Pink transportation in New Jersey" to make travel for women safe and sound but in some of the cases men also get humiliated and they also have security issues there are mapping services around the globe which provide you the shorted and less time taking the route of all possible ones but fail to provide a safe path let's have a look at the work done to provide a safe path for everyone.

2.1 SPaFE: A Crowdsourcing and Multi-modal Recommender System to Ensure Travel Safety in a City

2.1.1 Basic Idea

Navigating safe routes using already present tools like Google APIs.

2.1.2 Methodologies

Adaptive and Population-Based Algorithm, SPaFE

2.1.3 Result

Dynamic crowd-sourced-based safe navigation system to ensure safety for a range of user scenarios.

2.1.4 Limitation

- SPaFE can process only structured user responses from the users. That is why the user's response to a particular event is constrained by the system specifications.
- Risk reduction is average

2.2 Safe Path Recommender based on Crime Statistics using Distributed Database

2.2.1 Basic Idea

The research aims to build a web application to implement a safe path using crime statistics of New York on google map

2.2.2 Methodologies

Machine learning algorithm K means clustering, Google Map APIs

2.2.3 Result

Web app able to display different paths with different colors indicating danger level.

2.2.4 Limitation

- Availability

2.3 User Specific Safe Route Recommendation System

2.3.1 Basic Idea

The research proposes a safe path recommendation system that presents a safe route visualized on maps based on past criminal activities.

2.3.2 Methodologies

- K means clustering.
- Bayesian Network(Specific risk based on user profile).

2.3.3 Result

We achieve our project objective to provide safe routes on maps by using a decision network and Geospatial data analysis on past crime data.

2.3.4 Limitation

- User Specific (Gender, Age, And time).
- No live streaming.

Chapter 3

Project Vision

3.1 Problem Statement

- The big problem occurs with unsafety path.
- The user travel with uncertainty and is not sure about the path is secure or not. Most users are avoiding traveling from that aspect.
- So, our application to solve this problem. Suggest a safe path for the user for traveling and achieved the destination.

3.2 Business Opportunity

3.3 Objectives

3.3.1 Historical Data Collection

Data can be collected using the three most effective methods First is a newspaper which highlights the major or big crimes but fails to notice Small crimes which can affect the crime score Second is a Police station which can be the most effective way of collecting data that we can get a hand on minor crimes as well but the problem is there can be some

not reported crimes. Third is Humans, some surveys can be carried out to collect data from the residents which can be done by having multiple surveys to local residents, these residents can be divided into groups so that information of one group can be verified by another group and vice versa.

3.3.2 Designing a model

The unsupervised machine learning algorithm K-means clustering can be used in order to find the danger index of the possible paths between two points. These danger indexes or crime scores of each path will be associated with its corresponding path.

3.3.3 Application Development

The creation of a user-friendly application is our ultimate goal, This application will run on both the Android and IOS operating systems.

3.4 Project Scope

The scope of this project is to make a significant contribution to our nation's security. This system can be used to save people's life when they are traveling, we Recommend a safe path. We have detected the safe path according to the crime rate. In this project, we use New York City dataset.

3.5 Constraints

3.6 Stakeholders Description

They are the following stakeholders:

- Public users use our system.

- Developer like (NLP model developer, App developer)
- other companies like Uber, Cream, In driver.

3.6.1 Stakeholders Summary

This system can be used to Recommend a safe path for Public users, also companies like(Uber, cream, InDriver), and our project for security purposes to save human life.

3.6.2 Key High-Level Goals and Problems of Stakeholders

In a world full of crimes, it is not easy to leave home to travel from one place to another you always have a doubt of getting robbed or being humiliated. B-Safe is an application that enables the user to find a safe path between traveling points and return home safe and sound. B-Safe application is all you need just enter your location from point A to B and the system will recommend you the safe path between points and you will travel without hesitation. Furthermore, this system will also make sure that users can find property in riskless and liveable areas so that they can focus on living the life they want instead of thinking of any bad thing to happen. This system also aims to provide information to security agencies to secure the danger areas to protect innocent lives.

Chapter 4

Software Requirements Specifications

4.1 List of Features

- to get the source and destination from the user.
- suggests the path according to the crime rate.
- plot the safe root on Google Maps.

4.2 Quality Attributes

4.2.1 Performance

4.2.2 Security

4.3 Functional Requirements

- user must have to enter the source and destination.
- using k means clustering Algorithm to detect the crime rate according.
- final output must be plotted on Google Maps.

- If the user submits their feedback they must be login with a google account.

4.4 Non-Functional Requirements

- Add the feature to find the property we suggest the safe path.

- application deployed on the cloud.

4.5 Use Case Diagram

Use-case diagrams provide a high-level description of the capabilities and scope of a system. These examples also demonstrate the interactions between the Actors in the system. Use-case diagrams show what the system does and how the user interacts with it, but not how the system fundamentally functions.

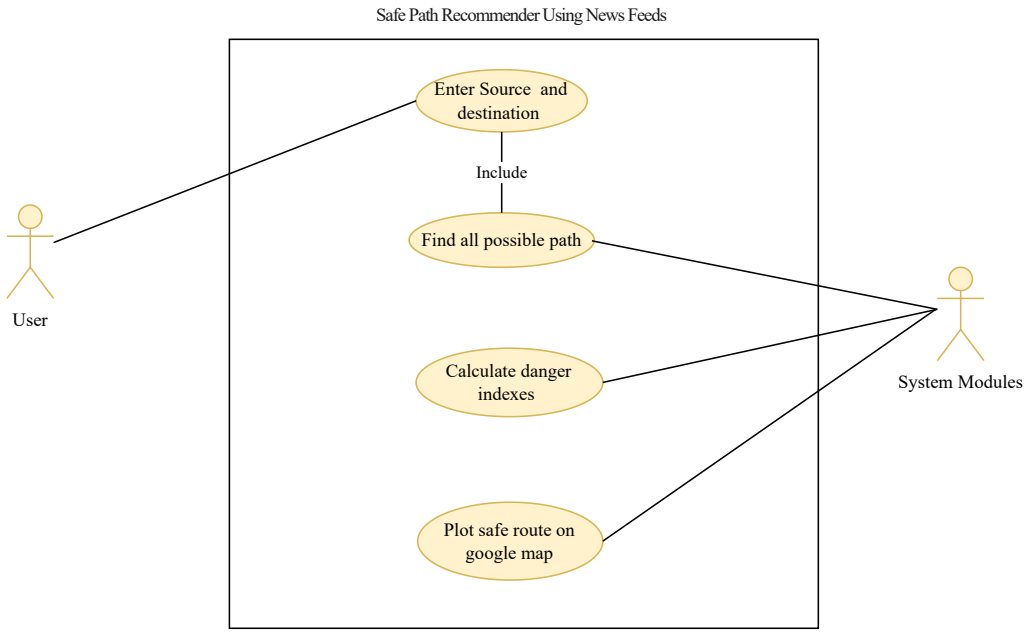


Figure 4.1: Use Case Diagram

4.6 Swimlane Diagram

A specific kind of flowchart is a swimlane diagram. Similar to a flowchart, it depicts a process from beginning to end, but it also classifies these stages to show which departments are in charge of each set of operations.

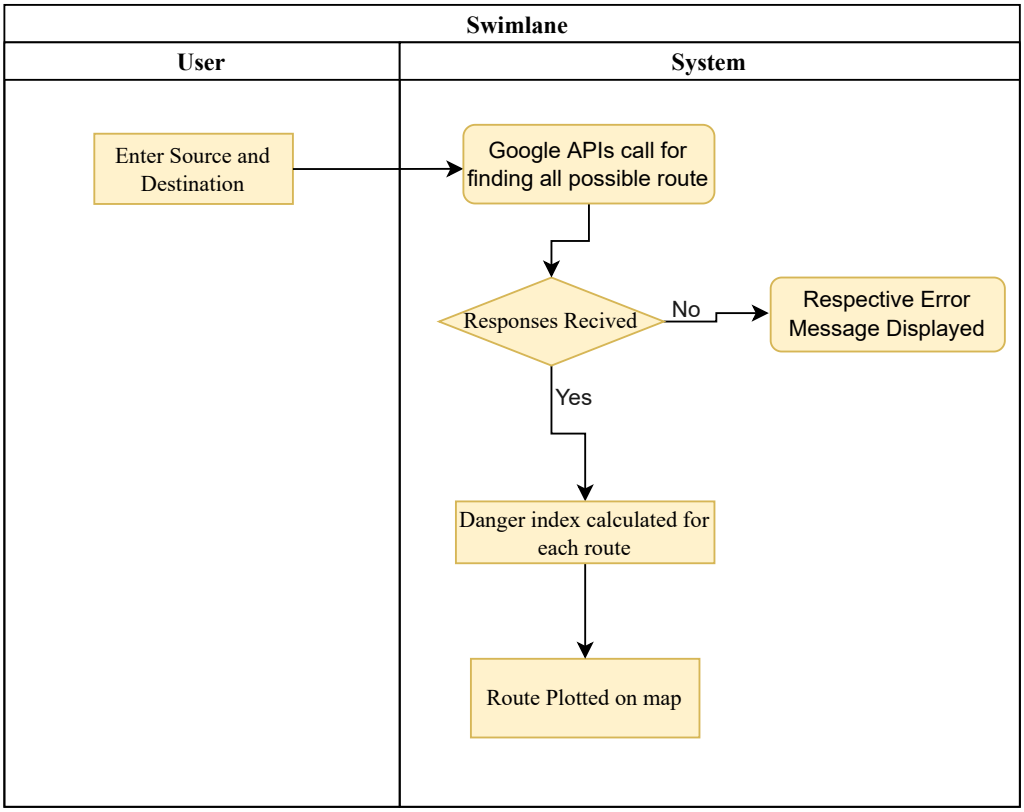


Figure 4.2: Swimlane Diagram

4.7 Architecture style

One of the most popular architectural styles is a layered architecture. The concept underlying layered architecture is the horizontal layering of modules or components with comparable functionality. Each layer so plays a certain function inside the program.

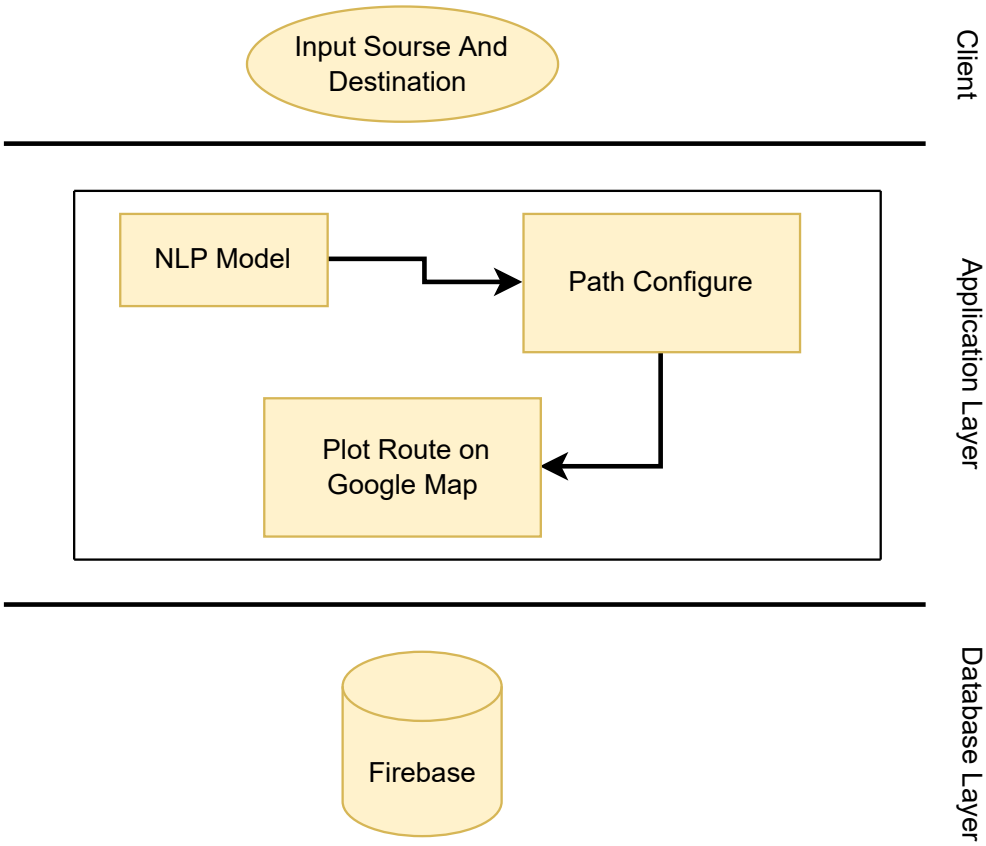


Figure 4.3: Layered Architecture Style

4.8 Test Plan (Test Level, Testing Techniques)

4.9 Software Development Plan

The Software Development Plan(SDP) describes a developer's plans for conducting a software development effort. The SDP provides the acquirer insight and a tool for monitoring the processes to be followed for software development. It also details methods to be used and the approach to be followed for each activity, organization, and resource.

Chapter 5

Iteration Plan

- Midterm FYP 1
  - collects the dataset from New York City.
- Final FYP 1
  - Create an NLP model.
  - Frontend Of application.
- Midterm FYP 2
  - Integrate the NLP in the Application.
- Final FYP 2
  - plot safe route on Google map
  - deploy the application on Cloud

Chapter 6

Iteration 1

The first iteration is expected to be completed by the midterm of the FYP-1. This chapter will have some of the artifacts based on system design. The requirements analysis section is same for all the systems while the design may vary. There may have two types of designs the structural design or Behavior Design. First section is for the structural design.

structural design

6.1 Domain Model/ Class Diagram

6.2 Component Diagram

6.3 Layer Diagram

6.4 Structure Chart

Behavior Design

6.5 Flow Diagram

6.6 Data Flow Diagram (DFD)

6.7 Data Dictionary

6.8 Activity Diagram

6.9 Network Automata/ Graphs or State Machine

6.10 Call Graph or Sequence Diagram

6.11 Interaction Overview Diagram

For all above designs

6.12 Schema Design/ ER Diagram

6.13 Data Structure Design

Any information

6.14 Algorithm Design

Any information

6.15 Development Phase

Comments, Naming Conventions, Static Analysis of Code, etc.,

6.15.1 Unit Test

6.15.2 Suites or Test Cases

6.16 Maintainable Phase

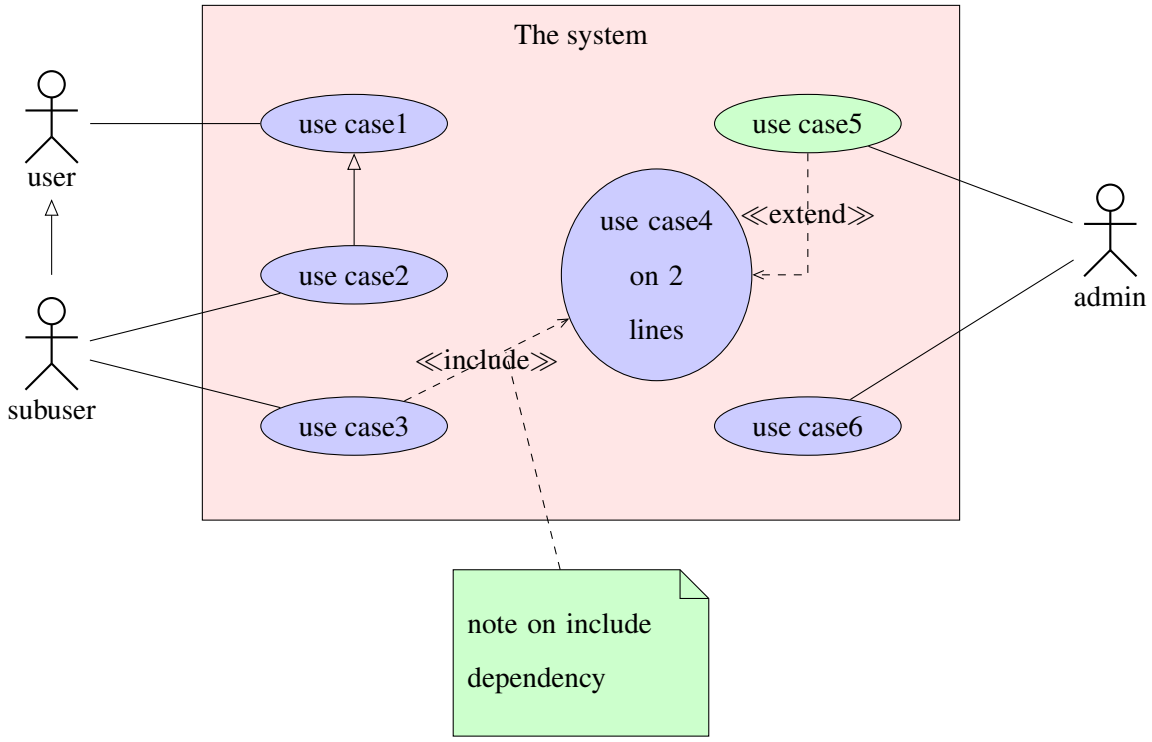
6.16.1 CI/ CD

6.16.2 Deployment Diagram

6.16.3 System-Level Test Suites, Test Cases

6.16.4 SVN or GitHub (Optional)

6.16.5 Configuration/ Setup and Tool Manual (Optional)



Chapter 7

Iteration 2

The first iteration is expected to be completed by the final of the FYP-1. This chapter will have some of the artifacts based on system design. The requirements analysis section is same for all the systems while the design may vary. There may have two types of designs the structural design or . First section is for the structural design.

structural design

7.1 Domain Model/ Class Diagram

7.2 Component Diagram

7.3 Layer Diagram

7.4 Structure Chart

Behavior Design

7.5 Flow Diagram

7.6 Data Flow Diagram (DFD)

7.7 Data Dictionary

7.8 Activity Diagram

7.9 Network Automata/ Graphs or State Machine

7.10 Call Graph or Sequence Diagram

7.11 Interaction Overview Diagram

For all above designs

7.12 Schema Design/ ER Diagram

7.13 Data Structure Design

Any information

7.14 Algorithm Design

Any information

7.15 Development Phase

Comments, Naming Conventions, Static Analysis of Code, etc.,

7.15.1 Unit Test

7.15.2 Suites or Test Cases

7.16 Maintainable Phase

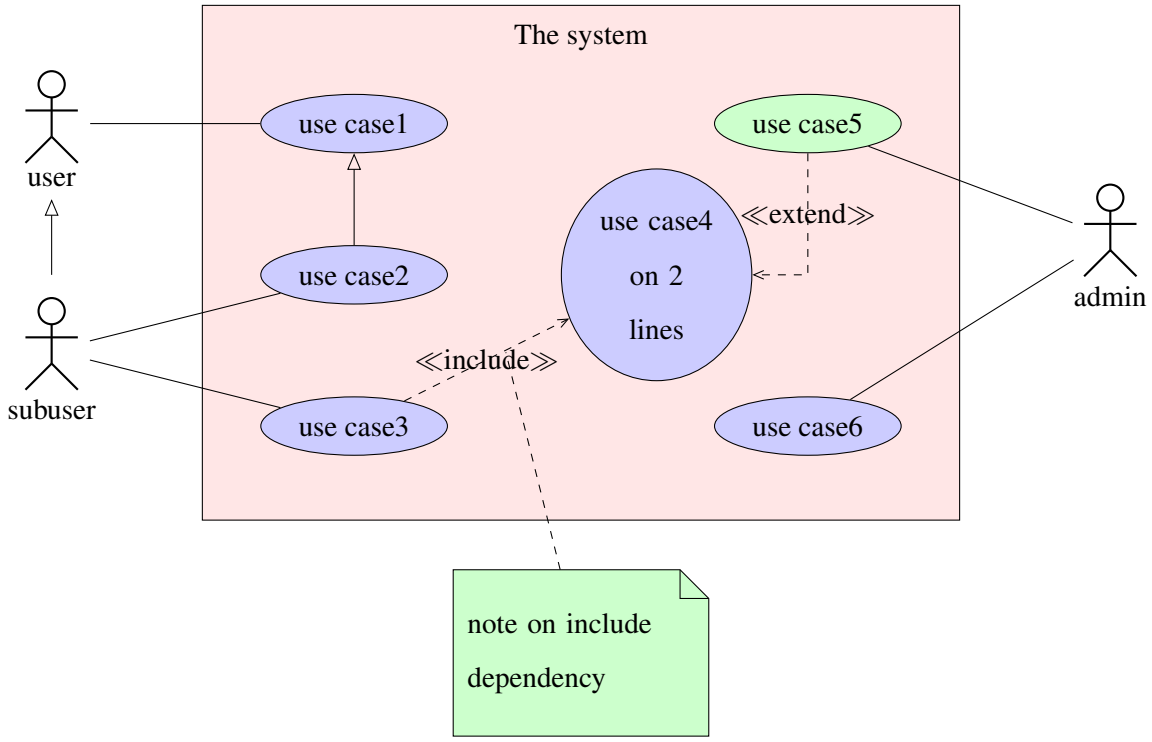
7.16.1 CI/ CD

7.16.2 Deployment Diagram

7.16.3 System-Level Test Suites, Test Cases

7.16.4 SVN or GitHub (Optional)

7.16.5 Configuration/ Setup and Tool Manual (Optional)



Bibliography