Software Design Document

<Accident Data User Interface (Placeholder)>

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# System Vision

A simple data analysis and visualization tool for a dataset. You will need to design and implement this tool, and it must provide a graphical user interface that will handle the analysis and visualization of the data.

## Problem Background

What’s the dataset?

Victora state accident dataset, crash statistics from 2015-2020 for Victoria. A way to analyse and represent this data in an easy to use and fast manner. An application that allows users to manipulate the dataset compare different parts of the dataset. Use keywords to compare and contrast different data points. Graph relevant data points and trends over time and display correlations between different factors.

What sort of data input/ouput is needed?

Text input and mouse clicks are examples of input that the software will receive. The text input will constitute users searching keywords, the mouse clicks users selecting periods of time. The software will output tabulated accident data and be able to formulate bar graphs for specific data points.

What problem does this solve?

The application allows users to automate certain data processing techniques. Saving the user time by generating results that allow users to check if specific keywords are tied to different types of crash data (e.g., determining how many accidents involved pedestrians). This frees the user from having to manually cross-check the dataset which would be immensely time-consuming and cumbersome for a dataset of this size. The software also provides the user with aggregated ready-to-use data representations in the form of bar graphs. These graphs can be taken directly from the interface and pasted into presentations. Supplying users with a way to tailor-make their own graphs to visually display whatever part of the dataset they are interested in.

Who’s going to use it and why?

The target audience for this software is individuals or entities with a vested interest in Victorian accident data. This is not limited to the Victorian Police, private insurance companies, government committees dedicated to road safety (e.g., Victorian Parliamentary Safety Committee), The Department of Transport and Planning, and non-profit organisations (e.g., Road Safety Promotion Australia). These entities will all use the software to review and draw conclusions on vehicular accidents in the state of Victoria. A non-profit may use this data to enact a target road safety plan. An insurance company might use this data to increase or decrease what they charge in excess for age groups.

## System Overview

What will the system do?

The proposed system will allow end users to manipulate the Victora state accident dataset. Displaying information in an accessible and easy to use manner. The key features of the system are as follows:

* Allow users to display all accidents that happened in a specific time-period.
* Produce a bar graph that displays the average number of accidents in each hour of the day for a selected period.
* Search a selected period by a keyword (e.g. collision) and retrieve all accidents caused by this accident type.
* Enable the user to examine, the impact of alcohol on accidents (e.g. most common accident type associated with alcohol).
* Allow users to graph the accident fatalities over the 5-year period to investigate data trends.

For a user-selected period, display the information of all accidents that happened in the period.

For a user-selected period, produce a chart to show the number of accidents in each hour of the day (on average).

For a user-selected period, retrieve all accidents caused by an accident type that contains a keyword (user entered), e.g. collision, pedestrian.

Allow the user to analyze the impact of alcohol in accidents – ie: trends over time, accident types involving alcohol, etc.

Features, functions

The application is data analysis instrument with a graphical user interface. It will contain a graphic pointer which will be the default windows mouse design to avoid confusion. A search bar area that is clearly marked. An attractive colour scheme that makes buttons and burger menus easy to find. The system must be able to aggregate data points and output an appropriate graphical visualisation. It must be able to respond to user directions in the form of a keyword search. Time periods within the dataset must be able to easily be selected.

What can’t it do?

The software is purely a dataset analysis tool. New data cannot be added, existing data cannot be deleted. The application takes input as keystrokes and mouse clicks, it will not respond to any other inputs (e.g., voice activation). The program's output is bar graphs and tables. It is not coded to produce other types of data visualisation (e.g., pie charts).

## Potential Benefits

How will this create a benefit?

# Requirements

## User Requirements

In this section you detail how a user is supposed to interact with or use your program. What do they ***need*** to be able to do? This should all be from the end users perspective. Can be a combination of narrative text and listing of needs.

**Assignment note: You have not been given a client/user, so you can make one up. Who do you think would be using your software?**

The end user is volunteer at a non-profit organisation runs the software. The end user needs to be able to easy find where to search keywords. The data that the user has access to needs to be streamlined and not overwhelming.

What the end user needs:

* Clarity, components of the graphic user interface, are minimalistic with limited ways to get lost in the interface.
* Efficiency, easily and quickly generates graphical data.
* Reliability, able to perform lots of iterations without errors.

## Software Requirements

In this section you detail what the requirements for the software are. What functionality will it provide? This is usually a formal listing, with requirements often using the word ‘Shall’. IE:

R1. The software shall load the Victoria state accident dataset.

R2. The software shall have a date dropdown menu where time frames can be selected.

R3.1 The software shall accept English words as searchable keywords.

R3.2 Words that are part of the accident description shall be displayed.

R4. Outputs from the program shall be displayed in a 250 x 250 pixel visual.

R1.1 The program shall accept multiple file names as arguments from the command line.

R1.2 Each file name can be a simple file name or include the full path of the file with one or more levels.

etc …

Can be primarily functional requirements, though you may include other types if you think of them.

## Use Cases & Use Case Diagrams

In this section you provide some use cases showing how people may use your software.

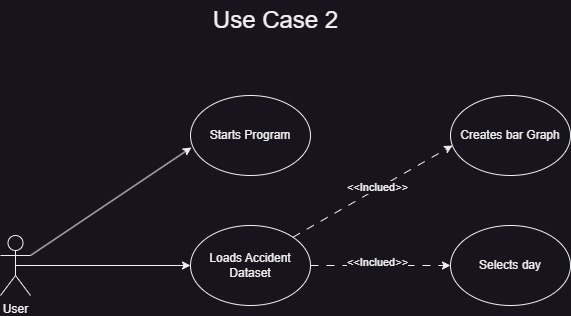
The software can be used to find and display treads in accident data in Victoria.

#A User example of using each of the 5 functions of the system

* Allow users to display all accidents that happened in a specific time-period.
* Produce a bar graph that displays the average number of accidents in each hour of the day for a selected period.
* Search a selected period by a keyword (e.g. collision) and retrieve all accidents caused by this accident type.
* Enable the user to examine, the impact of alcohol on accidents (e.g. most common accident type associated with alcohol).
* Allow users to graph the accident fatalities over the 5-year period to investigate data trends.

|  |  |
| --- | --- |
| Use Case ID | 1 |
| Use Case Name | Accidents per Timeframe |
| Primary Actor | User |
| Secondary Actor | None |
| Description | Creating a table of all accidents that have happened in a set timeframe. |
| Trigger | The user selects the timeframe that it wants to display. |
| Pre-Condition | The user opens the software and loads up the accident dataset. |
| Post-Condition | Accidents are displayed in table form. |
| Success Scenario | All accidents that occurred at that time are present. |
| Abort Scenario | Some or all the accidents are missing from the table. |

|  |  |
| --- | --- |
| Use Case ID | 2 |
| Use Case Name | Graphing accidents per hour |
| Primary Actor | User |
| Secondary Actor | None |
| Description | Creating a bar graph that shows the average number of accidents per hour on a chosen day. |
| Trigger | User selects the day they want to graph. |
| Pre-Condition | The user opens the software and loads up the accident dataset. |
| Post-Condition | Bar graph displaying the average accidents per hour on a given day |
| Success Scenario | The hours and accidents are correctly displayed, and the bar chart renders properly. |
| Abort Scenario | The chart doesn’t display correctly and/or the averages are incorrect. |



|  |  |
| --- | --- |
| Use Case ID | 3 |
| Use Case Name | Accident keyword search. |
| Primary Actor | User |
| Secondary Actor | None |
| Description | Producing accident results that contain the keyword that the user searches. |
| Trigger | The selects a period and searches a keyword. |
| Pre-Condition | The user opens the software and loads up the accident dataset. |
| Post-Condition | A table of accidents that contain the keyword is produced. |
| Success Scenario | The table correctly displays all the accidents containing the keyword for the selected period. |
| Abort Scenario | Accidents that do contain the keyword are shown and/or the timeframe is incorrect. |

|  |  |
| --- | --- |
| Use Case ID | 4 |
| Use Case Name | Graphing alcohol-related accidents |
| Primary Actor | User |
| Secondary Actor | None |
| Description | Creating a bar graph that correlates accident types and alcohol. |
| Trigger | The user selects a drop-down menu to sort by alcohol-related accidents. |
| Pre-Condition | The user opens the software and loads up the accident dataset. |
| Post-Condition | A bar graph that shows accident types that involved alcohol. |
| Success Scenario | An adequately rendered bar graph that correctly shows the different accident types and how many of each were alcohol related. |
| Abort Scenario | Graphic rendered incorrectly and/or incorrectly displays proportion of alcohol related incidents. |

|  |  |
| --- | --- |
| Use Case ID | 5 |
| Use Case Name | Graphing accident fatalities overtime |
| Primary Actor | User |
| Secondary Actor | None |
| Description | Creating a bar graph that maps accident fatalities over each year. |
| Trigger | The user selects the fatalities keyword to be graphed over each year. |
| Pre-Condition | The user opens the software and loads up the accident dataset. |
| Post-Condition | A bar graph that shows the number of accident fatalities each year. |
| Success Scenario | The bar graph displays the correct numbers, and the graphic is rendered well. |
| Abort Scenario | Incorrect fatality numbers and/or the graphic does not display properly. |

# Software Design and System Components

## Software Design

A block diagram/flowchart of how your software might work

## System Components

### Functions

Preliminary list of all functions in the software. For each function in the list the following information is provided:

* a brief description of what it does (1 or 2 sentences);
* a list of the input parameters, and their data types, and what they are used for;
* a list of any side effects caused by the function (ie change global or member variables, changes data passed by reference from calling function etc)
* a description of the function’s return value

### Data Structures / Data Sources

List of all data structures in the software (eg linked lists, trees, arrays etc) or eternal data sources. For each data structure in the list the following information is provided:

* Type of structure (tree, list etc),
* Description of where and how it is used
* List of data members, and what each one is for do
* List of functions that use it

### Detailed Design

Pseudocode for all non-standard / non-trivial algorithms that operate on data structures

# User Interface Design

This is your initial interface design. Describe the tools you used for this design stage and any key findings that informed your design. This introduction is descriptive and should explain what you have completed for the actual design work you will present in the sub-sections below.

## Structural Design

Structural design refers to the navigational and information structure of your product – the structure that supports the interface layout. How will you structure your product? How will you group your information? How will you navigate through your product? Why? This can take the form of a diagram showing structure and hierarchy, supported by a discussion and justification of your choices. Why have you made these design choices? Describe and outline the structure of your interface and of your information.

## Visual Design

Detail your visual design: Layout, visual elements, icons, graphics, style, colour, fonts general screen designs. This can be sketches, wireframes, mockups etc, supported by a discussion, explanation, and justification of your choices.