Software Design Document

UI implementation for Accident Data set

Manish Saily s5236772

Edward Winston s5133176

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# System Vision

## Problem Background

Data analysis is a time-consuming activity and researchers don’t always have the convenience to spend time on data analysis. To circumvent this issue the user interface will be created to help researchers analyse the data. This UI will be tailor made for car accident reports with. Governments and/or insurance companies will be using the UI meaning that they will supply the data, and we will be providing a visualisation of the data. The UI is a data visualisation tool. This means that the users will mainly be interacting with the program to visualise a set of data for ease of analysis. A data set was supplied which contained road crash statistics for a five-year period between 2015 to 2020 within the State of Victoria in Australia.

## System Overview

The software created in the project is a user interface which will allows for analysis of data and a visualisation. The user interface has been created with several functions. These include search by accident type, select time period, sort by speed zones, average number of accidents per hour and the effect of alcohol based on accident type. The tool will be coded in python with the use of the Pandas library and wxForm Builder. The data set that will be used is the Victoria State Accident Dataset and is in the form of a .csv file. The data will be visualised in the form of tables and charts depending on the analysis method that the user selected.

## Potential Benefits

There are several benefits for the creation of this user interface. This UI will allow the researchers to analysis data in a timely manner allowing for research to be produced quickly. The UI will be simple enough that researchers could use the UI for display the information for others. Produce charts that will help researchers display information. The chart will be produced by the UI for average number of accidents per hour. This will allow insurance researchers to provide data to insurance companies that will allow them to create specialised insurance plans based on the time their clients drive. The UI will allow the users to analysis the data resulting in better understanding for the relationship between alcohol and accidents. This UI will also aid in understanding the effects of speed zones on accidents. The UI’s ability to search by key words will allow researchers to access data on accidents by searching for their type.

# 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.

Assumptions: governments and/or insurance companies will be using the UI meaning that they will have the data already available, and we will be providing a visualisation of the data. The UI is a data visualisation tool. This means that the users will mainly be interacting with the program to visualise a set of data for ease of analysis.

The users should be able to select a period of time and display information from that time period. The information that should be displayed includes the following:

* the information on all the accidents that happened within that period of time.
* The UI should produce a chart to show the average number of accidents per hour, for each hour of the day
* Within the period of time it should be able to retrieve information on accidents by searching for key words such as pedestrian (user enters key words)
* The UI should allow the users to analysis the impact of alcohol in accidents by showing trends over time or accident types involving alcohol
* The user should be able to use the UI and be able to see the amount of accidents per speed zones in order to see the effect these zones have on total accidents

The users should have a menu to select the time period themselves. This will be in the form of a drop-down menu.

## 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:

R1.1 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 …

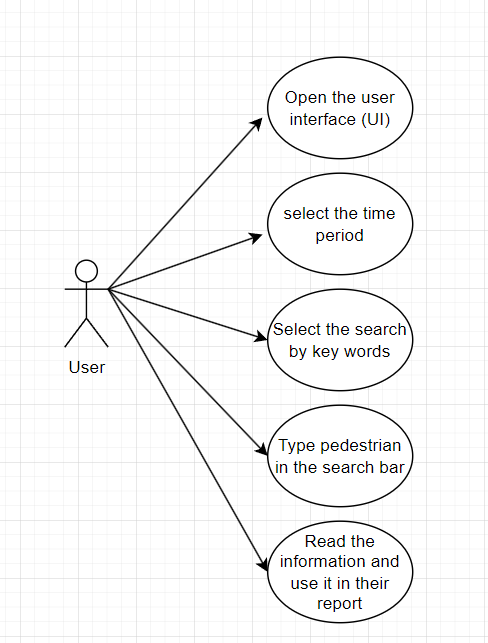
Can be primarily functional requirements, though you may include other types if you think of them.

So basically everything the computer need to be able to do. Ie login, access the data and more.

* The user interface needs to be able to access the data set
* The user interface needs to be able to read the data using pandas
* The user interface needs to be able to filter the data based on the year
* The user interface needs to have a drop down menu for the user to select the time period

## Use Cases & Use Case Diagrams

Use case 1

User is a researcher who is working for the government. He will be using the UI to find out the impact pedestrian have on accidents. The researcher will be using this data in his report. To achieve this he will use the user interface (UI) that we created.

Use case 2

A researcher is hired by a car insurance company to research the relationship between driving times and accidents. If the link between these two can be proven, then the insurance company can charge people more or less depending on when they usually drive.

A diagram of a person with text

Description automatically generated

Use case 3

The user is a government researcher who is researching the link between speed zones and accidents. The researcher will provide a report with this information to the policy makers to help inform the creation of new roads and the speeds that will be allocated to these roads.

A diagram of a person with text

Description automatically generated

# 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

search engine with user input keyword

data filter function by year

accidents per hour using a loop

create charts

sum key words with alcohol involved for percentage

### 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

How the end data looks after they click a button

Search by key words (2015-2016)

Inputed: collison with fixed object

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Accident type | OBJECTID | ACCIDENT\_NO | ABS\_CODE | ACCIDENT\_DATE | accTime | Severity |
| collison with fixed object | 3401744 | T20130013732 | ABS to receive accident | 1/07/2013 | 18:30 | Serious injury accident |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

3401744 T20130013732 ABS to receive accident

For the impacts of alcohol

Impacts of alcohol (2015-2017)

|  |  |  |
| --- | --- | --- |
| Accident types | % of alcohol involvement | Severity with alcohol involvement |
| Collison with fixed object | 20% of collison with fixed objects have alcohol involvement | 20% serious  80%other |
| Collision with vehicle |  |  |

### Detailed Design

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

Import libarys

Import the data

User selects time period (crop down menu)

# 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.

To create the initial interface design we used draw.io to convey ideas among the design team. These ideas were for the placement of buttons as well as the layout of the pages. Using draw.io wireframes were created which will allow us the visualise the end design.

Used draw.io, figma and wxForm builder

## 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.

There were several use cases outlined in 2.3 which showcase how the end users will use the application. Each of the end users will select the time period for their research first. Because of this, the drop down menu for the time period will be placed at the top. This is because it’s the first thing that the users will see. After the users have selected the time period they will then need to select one of the four buttons placed below it. These buttons will have a short description of what they provide. These will include Accidents per speed zone, Accidents per hour, Search by keywords and Alcohol impacts. When the users select these buttons, it will move to the next page.

For the accidents per speed zone it will display a bar graph showing the speed zones on the x axis and accidents on the y bar. Above this button there will be a text saying accidents per speed zone(year, year) in the year, year it will show the range that the end users selected in the previous page.

If the end users select the accidents per hour in the first page, then the page generated will be different. There will be a chart generated for the end users. On the x bar there will be the times of the day and on the y bar there will be the accidents. This chart will sit centre of the page and will have the title accidents per hour (year, year) with year being the user selected period.

On the home page if the users select the search by keywords it will generate a new page. This page will include a search bar at the top of the page. This search bar will allow the user to search using keywords. When the users enter a key word then the page will display a table showcasing the information of the keyword. This information will be for the time period the users selected earlier.

If the users selected the alcohol impacts then the UI will generate this new page. This page will display statistics relating to the impact of alcohol in a table. This table will be in the centre of the page with the title Impact of Alcohol per Accident Type (year, year).

## 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.