EXPLORING NEW ROUTING METHODS
Using Safety as a Vehicle Routing Factor

Individuals and businesses regularly use routing services, whether it be to find the quickest route between two places, or to find an optimal route for a fleet of vehicles. There are a range of free and paid options when it comes to performing routing analysis. These typically use real-time traffic data, predicted flow counts and advanced algorithms to find an optimal route. These services usually only produce the fastest and shortest routes. The aim of this research is to explore how safety can be used as a factor (impedance) in routing.

In 2010 the Ministry of Transport introduced the ‘Safer Journeys’ strategy with the aim to create ‘a safe road system increasingly free of death and serious injury’ (Safer Journeys, 2015). This strategy has led to the development of a number of different road safety initiatives and this project aligns itself with the aims of this strategy.

**AIMS**
- To explore ways of quantifying road safety so that it can be used for vehicle routing.
- To evaluate the feasibility of routing using safety data for the Auckland Region.
- To produce a routable network that takes input locations and calculates a route based on user safety, distance, and time preferences.
- To develop a user friendly routing interface in the form of a website.

**METHODS**
- Two ways of quantifying road safety were tested
  ii. The personal risk metric from Urban KiwIRAP (Brodie, Durdin, Fleet, Minnema, & Tate, 2013)
- A number of models were developed to:
  i. Automate some of the cleaning tasks
  ii. Calculate the necessary safety metrics (for both safety methods)
- Ideally a user would be able to choose to sacrifice distance or time to find a safer route. Solving a problem like this falls into the “Resource Constrained Shortest Path Problem” (Irnich & Desaulniers, 2005).
- To address this, a method of weighting was developed that combines safety, distance and time into a number of unique impedances.

**RESULTS**

- Through testing and comparison of both Urban KiwIRAP and the EEM methods, it was decided to use the Urban KiwIRAP data. Urban KiwIRAP provides more suitable results than the EEM methods. It takes traffic flow along each road segment into account when calculating risk and provides an absolute risk to the user (Figure 1).
- These results were combined with a vehicle routing network to prove that it is feasible to use safety as a vehicle routing factor.
- A user definable preference matrix was developed in conjunction with the weighting method. This matrix allows for users to specify their routing preferences for safety, distance and time (Figure 2).
- Routing and map services that were published to ArcGIS for Server are used on the website. The website was built using Javascript (Figure 3). The ArcGIS API for JavaScript was used to configure and display published services.

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**REFERENCES**