ACTIVITY MODELING FOR RISK ASSESSMENT AND E.M. APPLICATIONS FOCUSING ON PERI-URBAN REGIONS

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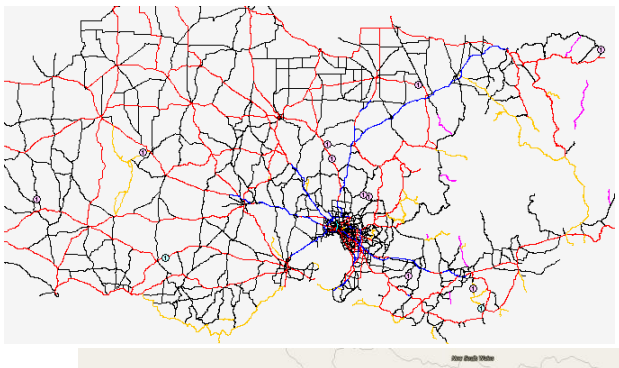
Is driving in a bushfire dangerous?

The figure below shows the location of all injury crashes in rural areas outside Melbourne on 7/2/2009 (Black Saturday) using VicRoads CrashStats.



And the figure above shows fires as recorded by NASA FIRMS 7 February 2009 suggesting a link between bushfires and crash risk.

This project seeks to answer two main research questions:

1. How dangerous is late evacuation? – as a number with confidence limits
2. What are the key contributors to this risk?

from the perspective of road travel activities.

Why the research is this important

By quantifying the risks of late evacuation, the risks of alternative options when confronted by a bushfire such as sheltering in place, or actively defending can be compared. This value will vary by location and would be useful for both individuals and policymakers.

By identifying the key contributors that make up this risk, further research into the area can be guided with a view to reducing the risk of late evacuation.

Even if late evacuation should never happen, it does and is worth researching.

What we know already

Hurricanes and bushfires are quite different in an evacuation. A single lane of a road can accommodate 2000 vehicles an hour, which is a substantial volume of traffic in the Australian context. In the 1969 Lara fire 17 people who abandoned their vehicles on the Melbourne to Geelong Freeway died, but at least six people sheltered in their vehicle and survived (Tibbits & Whittaker 2007).

The Oakland Hills (California USA) fire of 1991 with 25 people killed, many whilst evacuating associated with crashes blocking narrow roads (Routley 1991) piqued research interest in the USA and a review of evacuation plans for suburban enclaves in a number of US counties. (Church & Sexton 2002)

There are models for rural crash risk

$$A = 2.2E^{-04}V^{0.719} \times N^{0.078} \times G^{-0.26} \times Sr^{2.569} \times Vc^{0.219}$$

is a prediction of the number of crashes in five years for 100 meter section of rural road (Turner and Singh 2011). The terms relate to traffic volume, gradient, skid resistance, distance to trees etc. and the curvature of the road.

References

Church, RL & Sexton, RM 2002, *Modeling small area evacuation: Can existing transportation infrastructure impede public safety?*, April, Vehicle Intelligence and Transportation Analysis Laboratory National Center for Geographic Information and Analysis University of California, Santa Barbara, p. 20, viewed 21 May 2013.

Tibbits, A & Whittaker, J 2007, 'Stay and defend or leave early: policy problems and experiences during the 2003 Victorian bushfires', *Environmental Hazards*, vol. 7, no. 4, pp. 283–290.

Turner, S, Tate, F & Singh, R 2011, Next generation of rural roads crash prediction models: pilot study, viewed 21 May 2013, <http://trid.trb.org/view.aspx?id=1104060>.

Routley, JG, 1991, The East Bay Hills Fire Oakland-Berkeley, California, USFA-TR-060, viewed 22 July 2013, <http://www.usfa.fema.gov/downloads/pdf/publications/tr-060.pdf>.

What's happening next

The first step is developing a model for rural crash risk that incorporates factors related to bushfires. Historical crash data will be used to model crash risk and determine what are the appropriate factors such as shown in the previous equation, and whether they vary significantly in the proximity of a bushfire.

This only gives the answer for a simple segment of a road, so these segments will be combined with other segments to make a network and simulated vehicles and people will move through it. At the same time fire and smoke data from Phoenix will be applied. This then provides a basic tool for analysing where the risk lies and who is affected.

A key part of this model is the behaviour of individuals. BDI (Belief, Desire, Intent) agents will be used so they can “change their mind” as circumstances, and more importantly perceived circumstances change.

The work will study the Victorian 2009 fires and will also answer questions such as:

- Are falling trees a major impediment to evacuations?
- How many exits does an area need?

About Me

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