FIRE SPREAD PREDICTION ACROSS FUEL TYPES

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An Australian Government Initiative

UNEXPECTED BEHAVIOUR OF FIRE

Fire can behave in unexpected ways – it can spread in a direction at right angles to the wind.

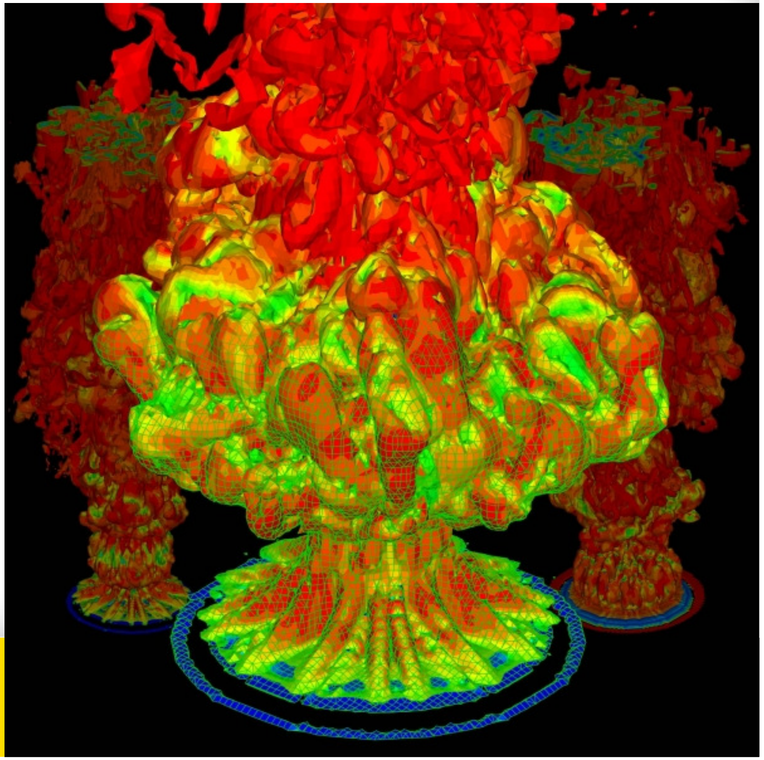
INFRASTRUCTURE AT THE PERI-URBAN INTERFACE IS AT PARTICULAR RISK

We must improve our design methods of infrastructure at the peri-urban interface.

WE NEED TO UNDERSTAND THE BEHAVIOUR OF FIRES IN MUCH GREATER DEPTH

An inexorable trend of science is that we study phenomena in ever greater detail.

We integrate the parts to understand and control the behaviour of complicated systems.



OBJECTIVES

The overarching objective of our project is to contribute to developing fast and accurate physics-based models of fire behaviour.

We are members of a community of end-users and fellow researchers.

THE TEAM

Daniel Chung – University of Melbourne.

Khalid Moinuddin – Victoria University.

Andrew Ooi – University of Melbourne.

Graham Thorpe – Victoria University.

THE TEAM

Prof. Jun-De Li
Mr Igor Grossman

Developing more accurate models of air flow in fires – speculative. Writing computer programs that will speed up calculations by at least 10 times.

Prof. Vasily Novozhilov

An expert of fire suppression systems using water sprays and water mists. A fire scientist.

Postdoctoral Fellow – to be appointed to the project.

END-USERS

Simon Heemstra – Lead end-user representative, NSW RFS.

Lawrence McCoy, Senior Fire Behaviour Analyst, NSW RFS

Gary Gifford – Assistant Commissioner Hazard Planning and Response, DFES, WA.

Matthew Wright – Deputy CEO, Fire Protection Association Australia.

OPERATIONAL MODELS

Fire fighters and controllers need models they can interrogate to predict the rate and direction of the of the spread of fires.

They need answers very quickly, and as close to real time as possible.

OPERATIONAL MODELS

Operational models are based on experiments – they are essentially empirical.

The rate at which fires spread depend on formulae that involve variables such as:

- The slope of the terrain
- Wind speed
- Type of fuel
- Fuel moisture content

PHYSICS-BASED MODELS

Physics-based models are useful because they can be used to:

Evaluate operational models over a wide range of conditions. The modelling group at UNSW identified that fires can spread at right-angles to the wind direction.

Propose new firefighting techniques.

Provide practical design guidelines for buildings at the bushfire/urban interface.

THE NEXT GENERATION OF FIRE SPREAD MODEL

Physic-based models take a long time to provide answers - they can take days.

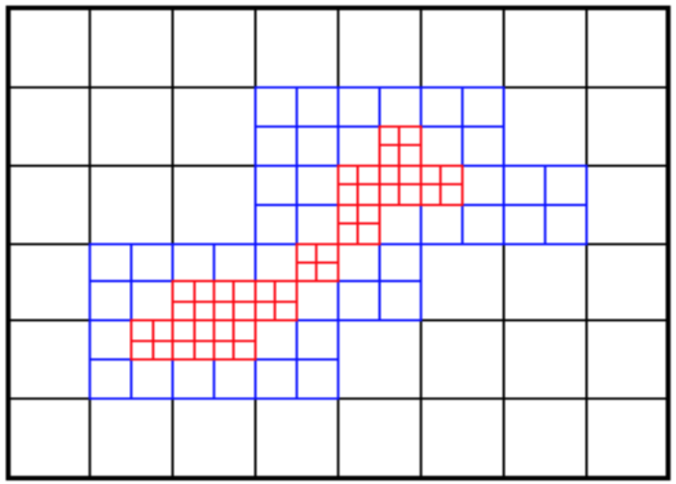
One of our prime objectives is to reduce the computation time.

Use state-of-the-art computer hardware.

THE NEXT GENERATION OF FIRE SPREAD MODEL

We will modify Wildland-Urban Interface Fire Dynamics Simulator computer software so that it operates more efficiently.

We will carry out computations only in areas where there are steep gradients of velocity, temperature and so on.



THE NEXT GENERATION OF FIRE SPREAD MODEL

We require data on the heat release rates of Australian vegetation. We will obtain this at the Victoria University Burn Hall located on the CFA site at Fiskville.

THE NEXT GENERATION OF FIRE SPREAD MODEL

Importantly, it has a 15MW calorimeter that is able to calculate the heat release rate of burning vegetation.

THE NEXT GENERATION OF FIRE SPREAD MODEL

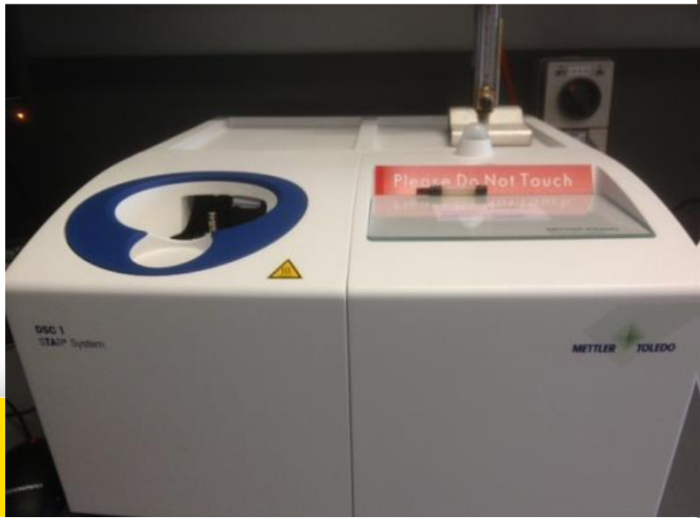
We will also carry out largely university funded research on the thermal and physical properties of Australian fuels. We have installed equipment with which to provide these data.

Heat of reaction

Thermal conductivity

Specific heat

Pyrolysis kinetics



THE NEXT GENERATION OF FIRE SPREAD MODEL

We need your inputs to make sure our work has practical benefits.