

Simulating Sandbagging for Flash-Flooding in Elwood



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Summary

This study is exploring the use of sandbagging depots for mitigating the impacts of flash-flooding in the inner-Melbourne suburb of Elwood. Through consultation with council, emergency services, and the community, researchers from RMIT University are building computer models to simulate potential outcomes using agent-based modelling and simulation technology. These simulations will help answer questions like:

- Are sandbag depots likely to be effective in limiting damage to homes during a flood event?
- If depots seem feasible, which locations would be most suitable?
- What queuing and filling processes would likely be most effective?
- Is the time of day when a flood occurs important?

About this study

This study titled Exploring the Adaptive Capacity of Emergency Management through Agent-based Modelling is funded by the National Climate Change Adaptation Research Facility and led by the RMIT Agents group in collaboration with City of Port Phillip and Victoria State Emergency Service.

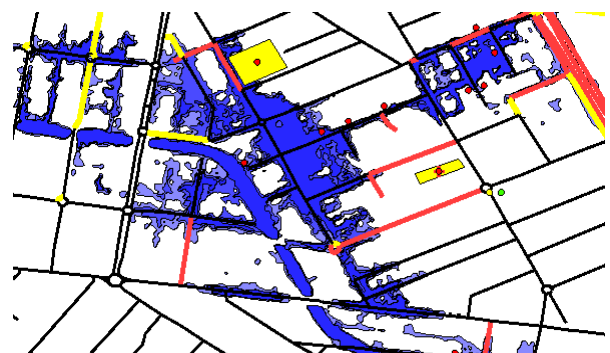
Severe flash-flooding in Elwood has raised concerns about the preparedness for extreme weather events.

In February 2011, the inner-Melbourne suburb of Elwood experienced severe flash-flooding and damage from a storm caused by a low pressure system from the passing cyclone Yasi. A similar flood in 2005 inflicted extensive damage to properties and vehicles. This has raised many questions about the intensity and frequency of such events in the region, as well as the preparedness of the local community, government bodies, and emergency services for extreme weather situations.

In this study, a multi-disciplinary team of social and computer science researchers from RMIT University are working closely with the City of Port Phillip council and Victoria State Emergency Service to develop computer models to simulate community behaviours around sandbagging during flash-flooding in the Elwood region.

Simulating Sandbagging Activities During Flooding

Discussions and interviews with the community, council, and emergency services, have been used to extract a better understanding of past flooding events and experiences in Elwood. Based on this consultation, it was identified that the use of sandbagging depots in the area should be investigated as a possible means of mitigating the risks of flash-flooding. The computer models and simulations developed focus on the movement of people between their home and predefined sandbagging depots, and is used for exploring settings and procedures most effective for protecting as many homes as possible before an impending flood.



Agent-based modelling is being used to simulate and understand sandbagging possibilities during flash-flooding.

The modelling uses actual flood progression data from past events in the area, and adds to that interactions of residents with flood waters as they go about obtaining sandbags to protect their homes. Multiple simulation "runs" of the scenario can then be used to explore questions like "Are sandbag depots likely to be effective in

limiting damage to homes during a flood?”, “How many would be needed and what would be good locations for such depots?”, and “What queuing and filling procedures would be most suitable?”

Simulation is a valuable tool for emergency management to evaluate existing as well as potential future operational policies and procedures. This is an iterative process of ongoing engagement and feedback from involved communities and local government organisations, to allow further improvement of the developed models and their underlying assumptions.

Agent-based Modelling and Simulation

Traditional mathematical modelling of complex systems is often too rigid and simplistic when it comes to representing social choices and behaviours. In reality, people are anything but perfect, and are prone to error and bias.

An innovative way to support the agenda of capturing people’s choices and interactions is through the use of agent-based modelling. This approach models behaviours at the level of the individual or “agent”, and by simulating the interactions between agents in a population, different emerging phenomena can be observed and analysed. In this way, future scenarios can be played out over and over again in a computer simulation, giving useful insights and explanations of possible future outcomes.

This approach models behaviours and interactions at the level of the individual allowing patterns of behaviour to emerge.



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Agent-based modelling is an analytical approach that provides an intuitive way of capturing the behaviour of different actors and the important chains of influence between them. Through repeated simulated situations, it provides a way of obtaining information about a wide range of possibilities, and how the key factors interact to influence future outcomes.

Agent-based Modelling and Simulation

Technology for representing and analysing complex systems involving many independent decision makers, such as those found in social systems, financial markets, and ecosystems.

Motivation

Mathematical models of complex systems with interacting individuals are either too simple or too perfect. “Agents” can be made to behave something like real people: prone to error and bias.

Benefits

More intuitive to model individual behaviours and interactions, and let patterns of behaviour emerge from those. Helpful for understanding complex outcomes.

About the RMIT Agents Group

The RMIT Agents group is internationally recognised in the area of intelligent agent systems with research spanning more than 15 years. The group has built a strong reputation for producing world-class research and undertaking successful collaborations with industry through numerous Australian Research Council Discovery and Linkage grants.

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