



Nuove modalità di approccio alla sicurezza inclusiva con i metodi della Fire Engineering

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Outline

- Evacuation modelling
 - *What are evacuation models*
 - *What results do we get?*
 - *How can we use them for inclusive fire safety?*
- Modelling vulnerable groups
- For which buildings/scenarios can we apply evacuation models?

Evacuation modelling

What are evacuation models?

Computer modelling
(research and commercial)

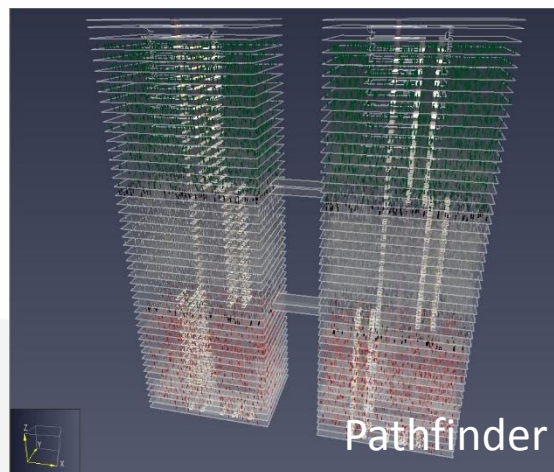
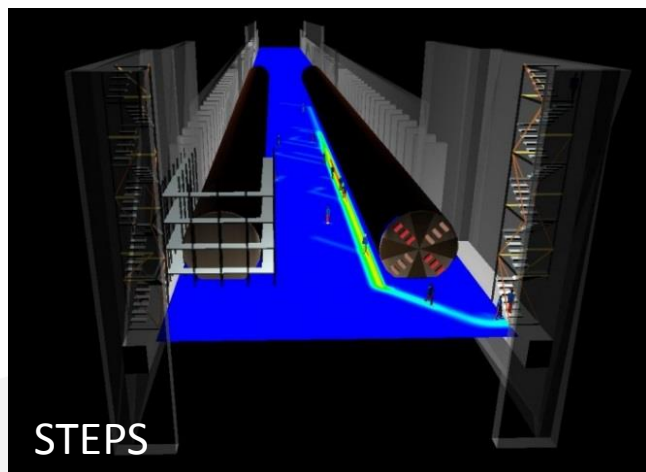
FSE tools for the representation
of human behaviour and people
movement during fire
emergencies

Movement (equation-based/agent-based)

- Hydraulic model in the SFPE handbook,
- Social force model
- Steering model, ecc.

Behaviours (generally agent-based)

- Time-line model (sequence of actions)
- Decision making



Evacuation modelling

What are evacuation models?

**Are evacuation models
able to predict
behaviours?**

DATA

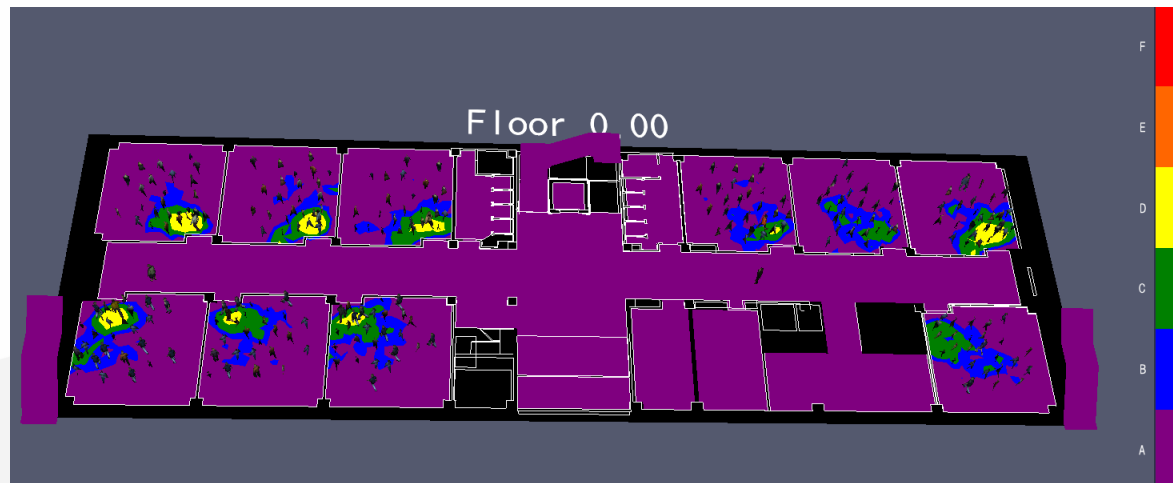
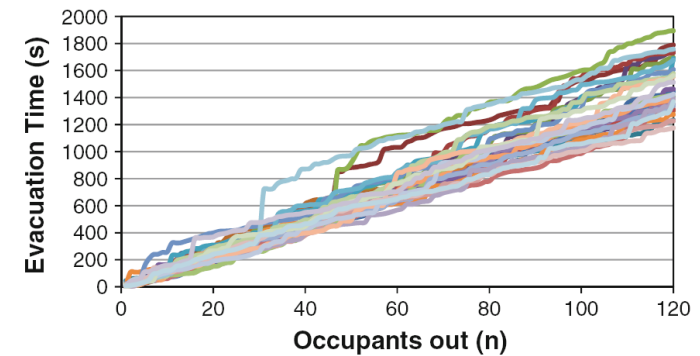


THEORY

Evacuation modelling

What results can we get from evacuation models?

- Total evacuation times
- Occupant-evacuation time curves
- Prediction of congestion levels (comfort and safety) and other emergent behaviours
- Toxicity assessment in case of fire-people interaction (Purser's FED model)



Evacuation modelling

How can we use of evacuation models for inclusive fire safety?

- Fire evacuation design

Assessment of escape routes (quantity, dimensions, etc.)

- Emergency management

Evacuation strategies

Use of egress components



Modelling vulnerable groups

Representing different people types

- Walking speeds

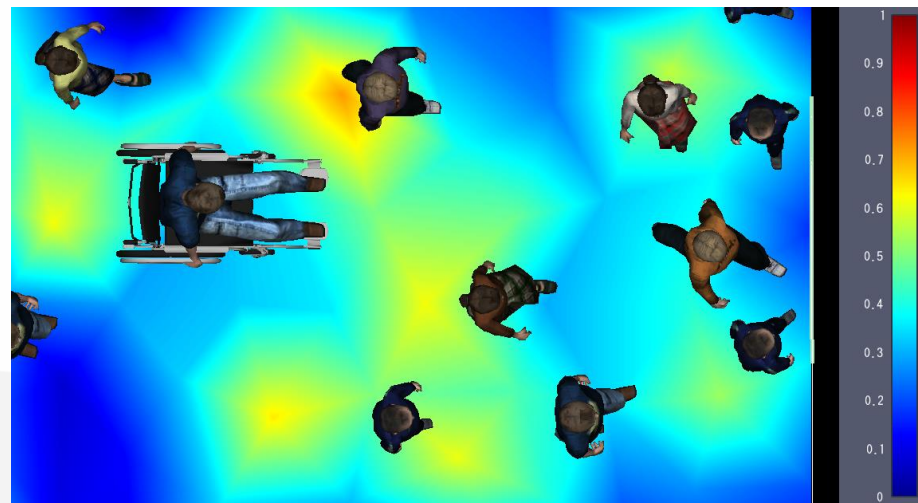
Example of vulnerable groups: wheelchair users, children, elderly people, etc.

- Space usage during egress (safety/comfort)

Needed space

vs

Available space



Modelling vulnerable groups

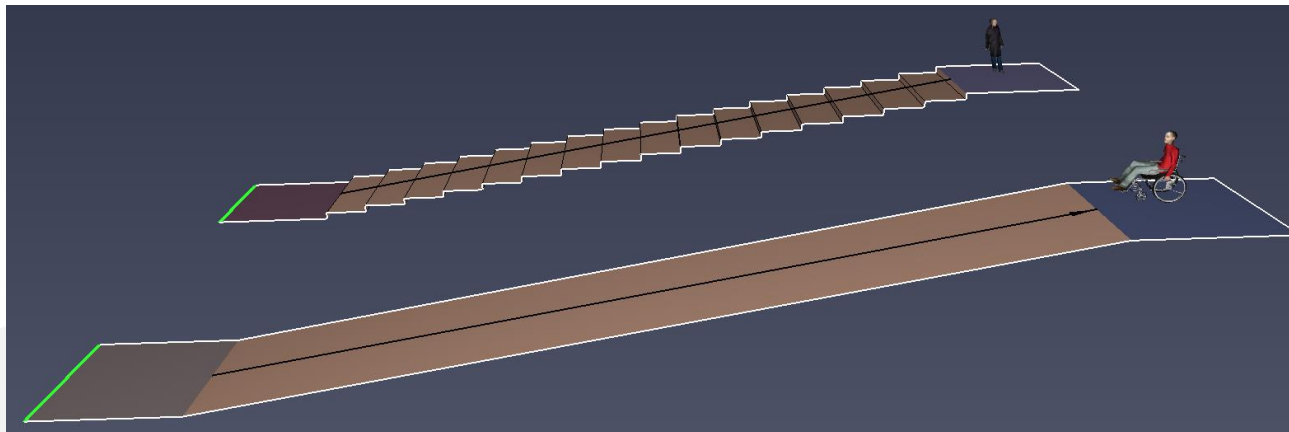
Representing different people types

- Egress abilities

Self rescue vs assisted evacuation

Use of egress components

(stairs vs ramps, elevators)

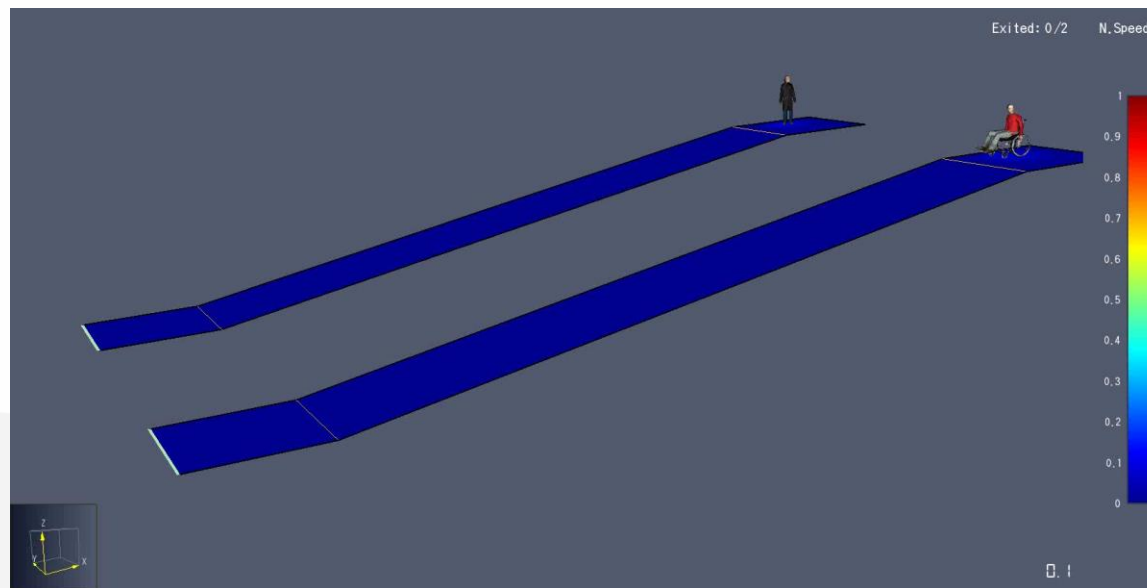


Modelling vulnerable groups

Representing different people types

- Egress abilities

Several people variables can be customized (e.g. walking speeds)



Modelling vulnerable groups

Representing different people types

- Assisted evacuation procedures



For which buildings/scenarios can we apply evacuation models?

Examples of scenarios

- Analysis of evacuation procedures of vulnerable groups (both self rescue and assisted)
- Study of refuge floors/areas
- Elevators for evacuation



For which buildings/scenarios can we apply evacuation models?

Examples of building types

- Transportation terminals (e.g. underground)
- High-rise buildings
- Schools
- Health care facilities (hospitals)
- Retirement houses, etc.


For which buildings/scenarios can we apply evacuation models?

Application of evacuation models for buildings with vulnerable populations

NOT ONLY FOR “SPECIAL BUILDINGS”!

Every building fire evacuation design should account for vulnerable populations!

Conclusions

- Evacuation models can be a useful tool to design inclusive safety
 - Models allow to represent different behaviours and use of egress components
 - Great potential for FSE design
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Contact information

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