Evacuation Bottleneck
Simulating a Panic on a Cruise Ship

Johannes Weinbuch, Benedek Vartok

December 17, 2012

Outline

Our Research Object

- Costa Voyager
- Capacity: 836 passengers
- 8 Rescue Boats
- In distress at sea in 2005

Source: http://www.shipspotting.com,
Picture taken by Roy Batty

Introduction
Our Model
Implementation
Results
Summary and Outlook

Input
Forces
Filled Exits

The Deck Plan

- ▶ Colormap
  - ▶ Allows any number of zones
- ▶ Scaling
- ▶ Greatly simplyfied

Source: http://www.kreuzfahrtberater.de

- TODO: config file

Introduction
Our Model
Implementation
Results
Summary and Outlook

Input
Forces
Filled Exits

► TODO: desired, agent-, wall-forces

Introduction
Our Model
Implementation
Results
Summary and Outlook

Input
Forces
Filled Exits

► TODO: exits

► TODO: we reused code from Multilevel Evacuation

Introduction
Our Model
Implementation
Results
Summary and Outlook
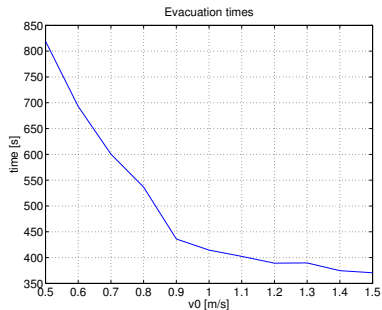
Passenger Distribution
Panic Level
Outtakes

Distribution of the Agents to the Exits

- ▶ The distribution depends strongly on the geometry of the ship.
- ▶ There was no case where the agents really distributed over the exits
    - ▶ Weakness in the model
    - ▶ More realistic: go for the shortest individual evacuation time
- ▶ realistic update for propagation of information
- ▶ Video

Introduction
Our Model
Implementation
Results
Summary and Outlook

Passenger Distribution
Panic Level
Outtakes

Effect of desired speed to the overall evacuation time

- ▶ We could reproduce the results from Helbing, Farkas and Vicsek for low panic levels
- ▶ High panic levels: problem!

Introduction
Our Model
Implementation
Results
Summary and Outlook

Passenger Distribution
Panic Level
Outtakes

All the things you don't want to happen

- ▶ Agents were stuck in Walls
  - ▶ Even the tiniest timesteps didn't help
- ▶ MATLAB does not behave as expected in batch mode
  - ▶ Simulation works in foreground, crashes in background
  - ▶ No error message, just silently writing crashdumps to home
- ▶ No reproducability even with fixed random seed in our group
  - ▶ Different versions of MATLAB

Some points to take away

- ▶ The basic results could be reproduced
- ▶ The model is not very well suited for multiple exits
  - ▶ There should be a heuristic to decide for a direction
- ▶ Use the power of Open Source Software (OSS)!

You ask – We answer

► Now it's your turn