Evac Sim: Fall 2020 CSS600 Group Ten Project

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1 Introduction

The inherent dangers in doing live simulations of emergency evacuations has led to an increasing reliance on computer simulations to understand emergent behaviors of crowds under strenuous conditions[1]. Our project will seek to understand crowd evacuation behaviors through the modeling of a variety of environmental and agent factors in the NetLogo simulation suite.

2 Experiments

3 Environment

4 Deliverables

We will deliver a formal paper describing our experiments, the simulation software we created, our results, and the conclusions we can generate from those results. In addition we will develop presentation material to communicate concisely our overall project that will include live simulations or video recordings of previous simulations.

NOTES

Fire Sim models emergency evacuation of a chosen floorplan, for example in the case of fire.

The environment patches include rooms, corridors, and exit areas, as well as patches in normal, burning, and burnt states.

Agents are randomply placed people moving at various speeds and directions, but which can die and block each other.

Maps are editable for layout, patch flammability, number of agents, initial fire locations, agent speed range and plancement.

Research Goals:

- Evaluate the affect of floor plans and exit doors on escape rates
- Determine maximum occupancies as function of design and area
- Evaluate the impact of fire spread on escape rates
- Stretch Goals
  - Evaluate agent evacuation strategies
  - Evaluate propogation of knowledge of fire
  - Simulate smoke propogation

Prior art for this project includes, but is not limited to:

- Crowd Simulation Modeling Applied to Emergency and Evacuation Simulations using Multi-Agent Systems https://arxiv.org/ftp/arxiv/papers/1303/1303.469
- Simulation of pedestrian evacuation route choice using social force model in large-scale public space: Comparison of five evacuation strategies https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6730895/
- Agent Pathing http://www.cs.us.es/ fsancho/?e=131
- A Novel Algorithm for Real-time ProceduralGeneration of Building Floor Plans https://arxiv.org/pdf/1211.5842.pdf

HOW IT WORKS
Simulation Req's:
Environment- patches
exit area
Flammable patches
– walls
– floors
– grass
Burning
burnt
Agent actions
agents have variable speeds

agents can die
agents move towards exit area
agents cant move through each other
the number of agents is variable
agents are randomly placed on floor patches
is there a way to specify agent placement through the UI?
Sim UI features:
can specify the map
can control flamability of patches
number of agents
starting fire spots
agent speed distribution

References

[1] João E. Almeida, Rosaldo J. F. Rosseti, and António Leça Coelho. Crowd Simulation Modeling Applied to Emergency and Evacuation Simulations using Multi-Agent Systems.