Hospital Evacuation

Bits Please

Overview

- Premise: Doctors and patients are attempting to evacuate a hospital during a gas leak

- Types of agents: doctors (intelligent), patients (intelligent), gas particles (dumb)

- Doctors will have the ability to lead patients towards exits and to safety

- Human agents encountering gas particles become dead

Local Decisions & Parameters

Gas

- Location: Current location of gas agent within the hospital

- Spawn Rate: how quickly an agent respawns. This parameter mimics the nature of a gas to spread to fill it's container and will be constant between all gas agents.

A single gas particle is spawned at the beginning of the simulation and can spawn in a random direction.

Local Decisions & Parameters

Human Agents

- Location: Current location of human agent within the hospital

- Radius of knowledge: measures how much of its surrounding an agent is aware of. Constant between all doctors/patients and larger for doctors.

- Speed: higher for doctors

- Dead: boolean to represent death by gas

Local Decisions & Parameters

Doctor

- Followers: number of patients currently following a doctor. Tie breaker - doctor with highest follower count wins

- Charisma: doctor's persuasiveness

A doctor will continue to attempt to find and lead patients to safety until they can no longer find patients to lead or when it must exit due to encroaching gas agents.

Local Decisions & Parameters

Patient

- Panic: rationality - more panic = less likelihood to follow a doctor, impacted by other patients encountered

- Cooperation: likeliness to follow a doctor

A patient agent's only goal is to safely exit the hospital, but they will act less rationally as their panic level increases.

Desired Emergent Behavior

- We expect to see patterns in the crowd's behavior as it attempts to evacuate the building as a group

- A more controlled crowd will be more efficient (in terms of time and survival rate)

- Higher average charisma + lower panic -> more controlled

- Fewer bottlenecks will be observed as efficiency increases

Hypotheses

- Hypothesis 1: The greater the average charisma of the doctors and cooperation of the patients, the greater the survival rate will be.

- Hypothesis 2: Greater panic levels will decrease the efficiency of the evacuation by increasing the amount of time taken and decreasing the survival rate.

- Hypothesis 3: A higher ratio of doctors to patients will increase the number of patients who survive and decrease the amount of time it takes to evacuate the hospital

Experiments

- Hypothesis 1: Four sets of trials with varying doctor charisma and patient cooperation (low charisma/low cooperation, low charisma/high cooperation, high charisma/low cooperation, high charisma/high cooperation)

- Hypothesis 2: Vary starting patient panic levels & observe effective panic over time

- Hypothesis 3: Vary doctor-patient ratio & observe efficiency