Simulating Animal Crossing New Horizons

MSDS460 Decision Analytics Term Project

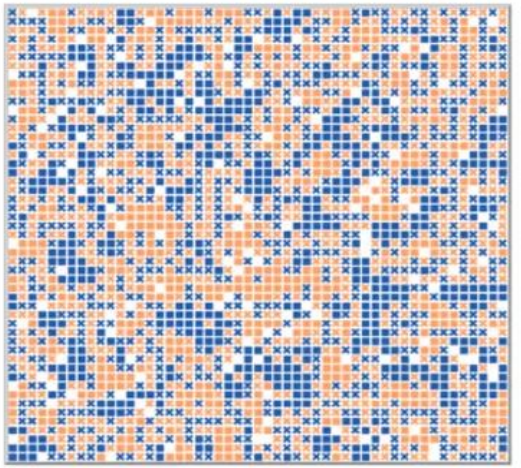
Sally Lee

Problem Definition

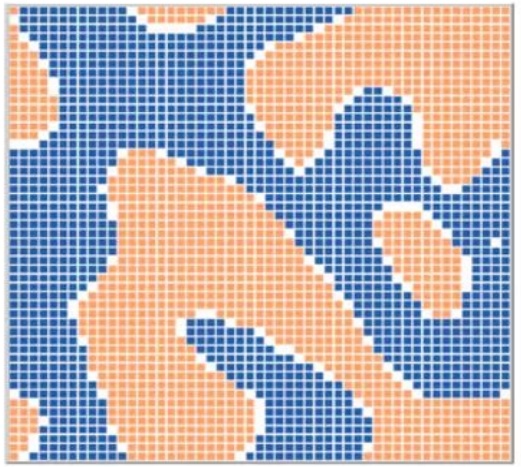
- **Objective:** Simulate the dynamic behaviors of autonomous entities in a virtual environment
- **Goal:** Understand emergent behaviors and social interactions in life-simulation games
- **Methodology:** Use Python’s mesa module to create an agent-based simulation

Applications and Literature

- Agent-based modeling (ABM) has been widely used in pandemic modeling like the recent COVID-19 spread
- ABM helps urban planners study traffic congestion and autonomous vehicles
- Foundational work by Thomas Schelling *Dynamic Models of Segregation* 1971



(a) The start of the simulation



(b) After 116 steps

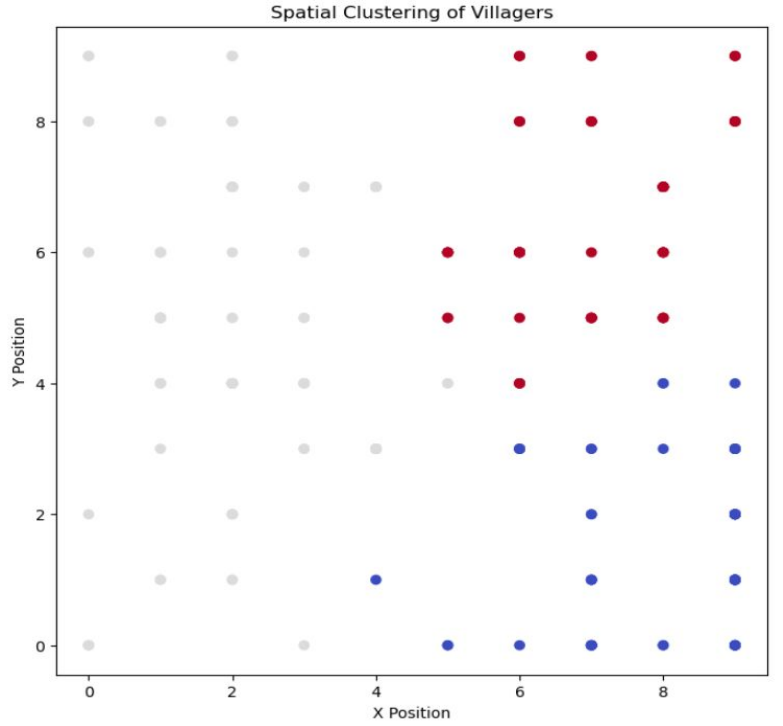
Design

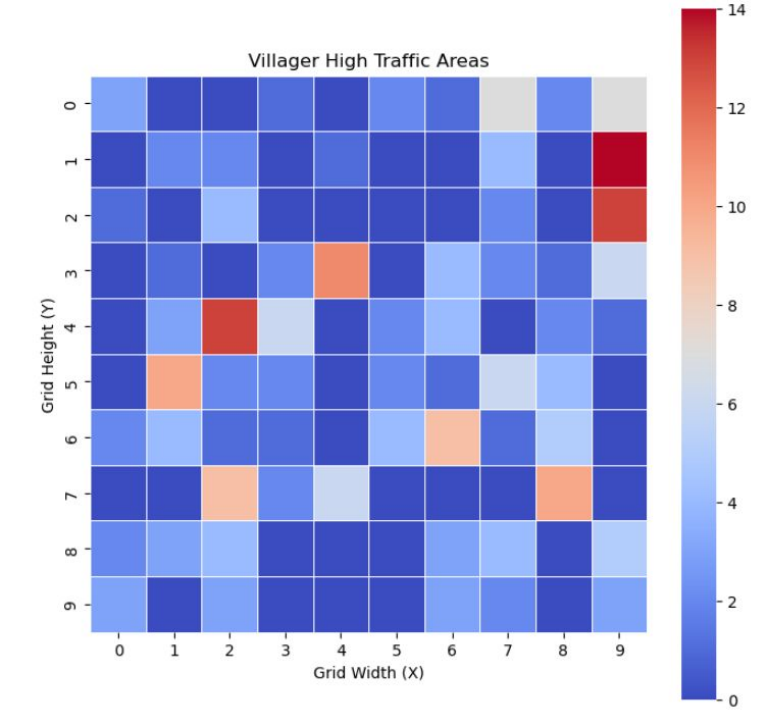
- Each villager is an autonomous agent with a randomly selected predefined personality influencing activities and sleep cycles
- Simulation iterates through daily cycles, tracking movement, interactions, and tasks
- Used publicly available game data for parameters and states

Parameters

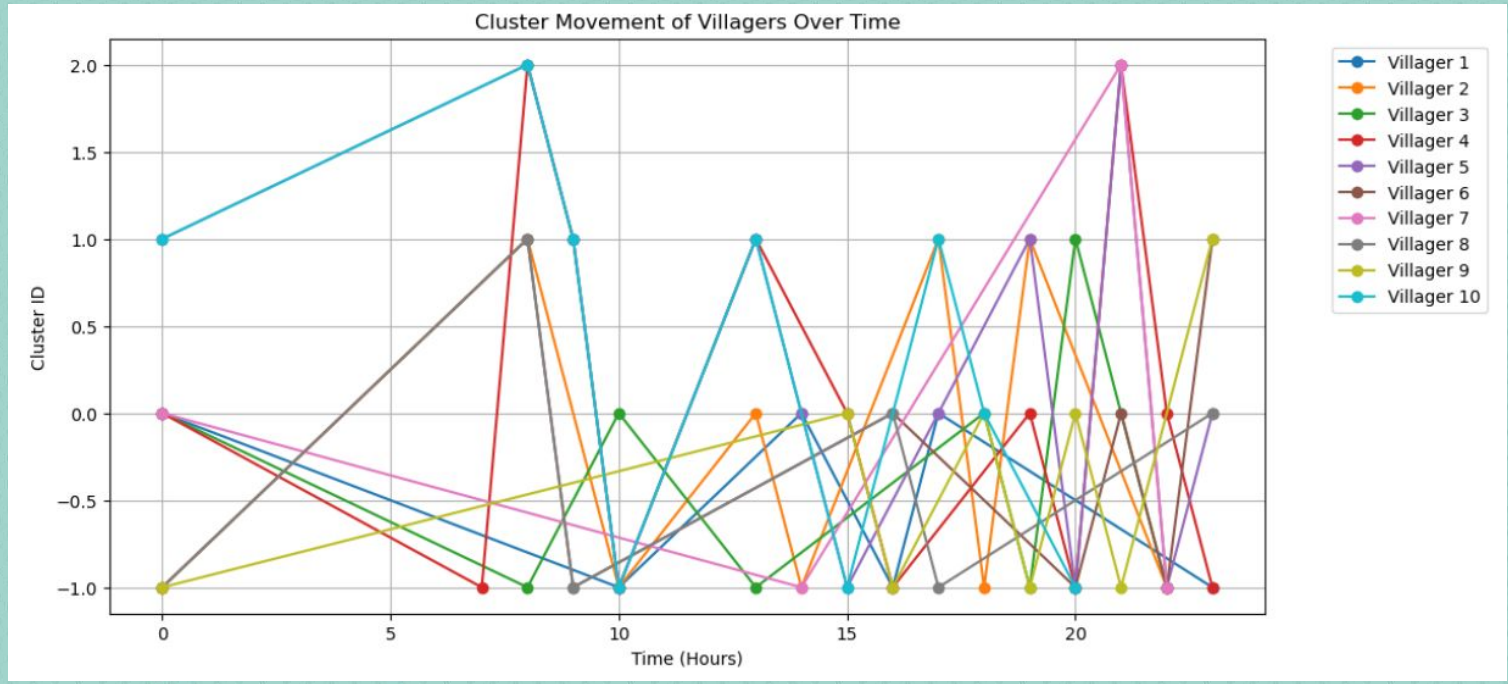
- **Number of Villagers (agents):** Adjustable by model
- **Sleep schedules:** Determines when the agents are active
- **Personality traits:** Determines likelihood of activity
- **Agent activities:** What states the agents can be in
- **Map size:** Adjustable by model

Results

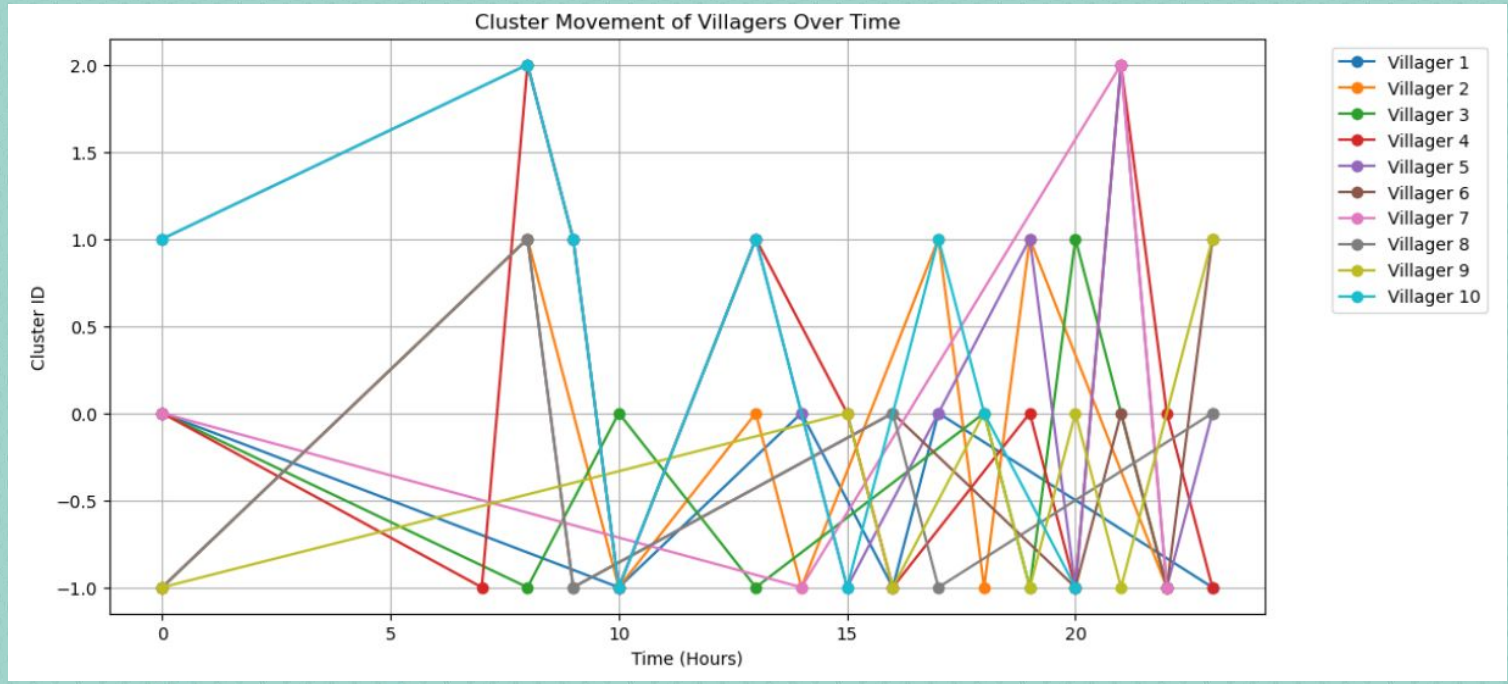

Spatial Clustering of Villagers
Y Position
X Position
0
2
4
6
8


Villager High Traffic Areas
Grid Height (Y)
Grid Width (X)
0
1
2
3
4
5
6
7
8
9
14
12
10
8
6
4
2
0

Results


Cluster Movement of Villagers Over Time
Cluster ID
Time (Hours)
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
0
5
10
15
20
Villager 1
Villager 2
Villager 3
Villager 4
Villager 5
Villager 6
Villager 7
Villager 8
Villager 9
Villager 10

Results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Future Improvements

- **Path-finding:** Navigation using algorithms e.g. Dijkstra’s
- **Advanced decision-making:** Reacting to environment and events
- **Weather system:** Influences behavior
- **Emotions/Mood:** Agent interactions can affect mood and influence behavior