

Simulation of human behavior in relation to space, agent-based models

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Post-occupancy evaluation

Derive generally valid behavior patterns



Digital simulation

Pre-occupancy evaluation

verify human behavior in early stages of design

Physical model

- Real scale model
- Traditional way
- Size limitations

Virtual Reality

- Overcomes size limits
- Limited number of people
- Quality issues of the overall experience
- Absence of tactile sensations
- VR sickness

Space Syntax

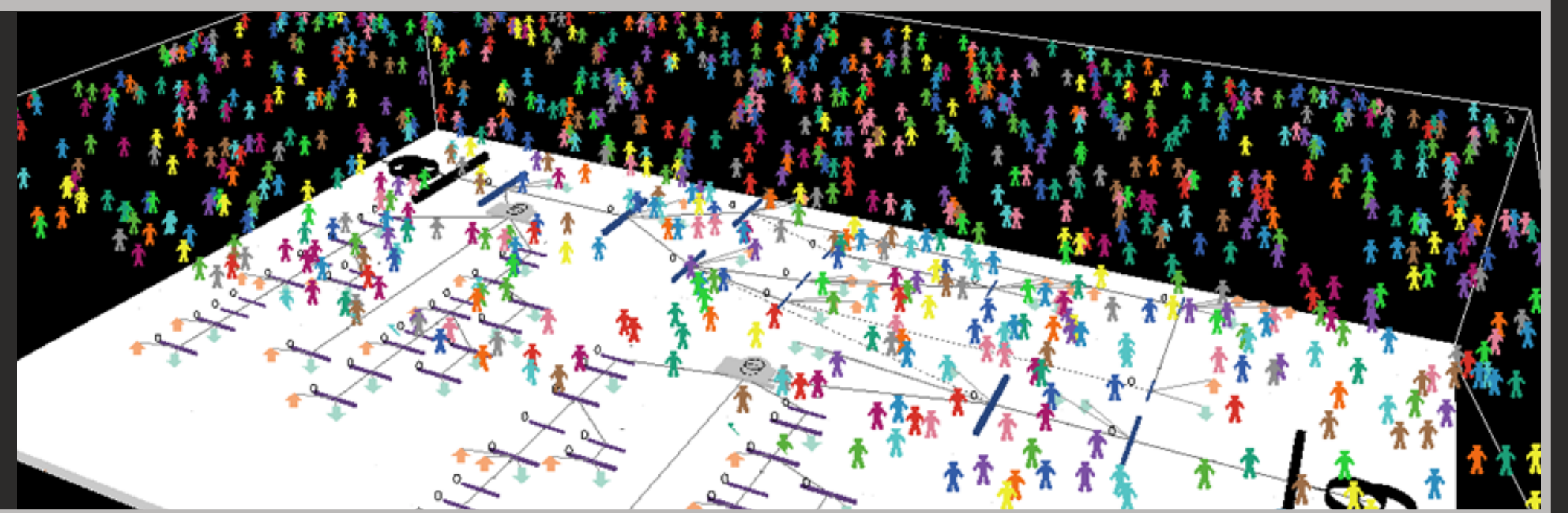
- Analysis of the relationships between the morphology of space and human behavior
- lacks dynamic aspects such as human interactions, time changes

Dynamic models

- Particle based methods; physical and social forces of mutual attraction and repulsion
- Fluid-based methods
- Cellular automata
- Process driven models

Agent-based models (ABMs)

„a system is modeled as a collection of autonomous decision-making entities called agents. Each agent individually assesses its situation and makes decisions on the basis of a set of rules.“ (Bonabeau, 2002)



Bottom-up strategy

Decision-making in ABMs (Rule-based)

Combination of bottom-up and top-down strategy

Finite State Machines

general schema

example

Markov Chain

general schema

Behavior Trees

general schema

example

Goal Oriented Action Planning

general schema

example

Narrative Based Modeling

general schema

Planned narratives

1. Visit Coffee shop	2. Sit on a bench	3. Agent to agent interaction	4. Agent to environment element interaction
walking to the coffee shop	walking to the bench location	agent moves to the closest agent	agent moves to an attractor
enter the coffee shop	sit down on a free bench	agent interacts with the other (2min)	agent stops
sit in the coffee shop (10min)	sitting on a bench and interacting with phone (5min)	agent inspects the attractor and takes a picture	
exit the coffee shop (10min)	stand up		
walk to the scene exit	walk to the scene exit		

Unplanned narratives

example

What is the potential and benefit of digital simulation of human spatial behavior in the architectural or urban design process?

Research question

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