Simulating Neighborhood Change: A Case Study of the Atlanta Beltline

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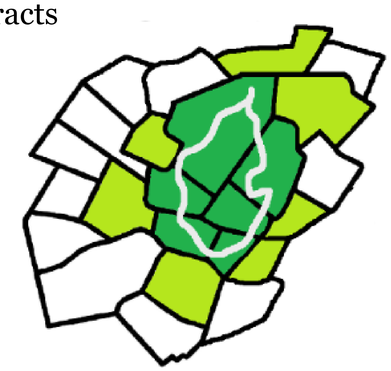
Problem Statement

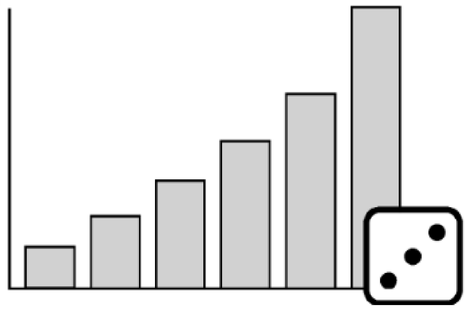
- Urban development projects generally seek to improve accessibility to amenities and economic opportunities. However, they can also have unintended consequences. To anticipate these issues ahead of time, we propose a computational simulation tool that can help urban policy makers better plan large-scale infrastructure projects.
- As a case study for our simulation framework, we focus on modeling neighborhood change in and around the Atlanta Beltline, an area that has historically had issues with gentrification.

The Modeling Framework: No Regret Dynamics

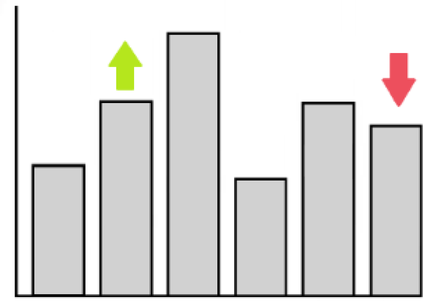
- Initialize N agents randomly dispersed across a set of census tracts



- At each timestep, agents randomly pick a new tract to move to based on their current probability distribution and incurs a cost



- Based on the incurred cost, the probability distribution for each agent is updated



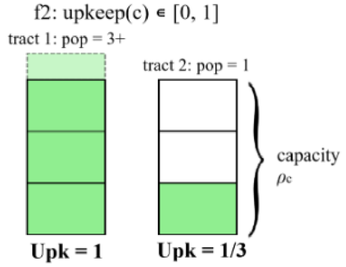
The Cost Function

- Overall "cost" of agent relocating to a particular census tract, is based on three sub-scores:
  1. Affordability (can an agent afford to live there?)
  2. Upkeep (does the tract exhibit signs of basic habitation/maintenance?
  3. Attractiveness
     - Community Ties (how similar is the agent's endowment compared to the endowments of its neighbors?)
     - Amenity Access (how many amenities are there?)
     - Beltline Score (proximity to the beltline)

f1: affordability$_a$(c) ∈ {0, 1}

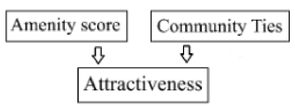
(A) Only a certain number of agents may deem a tract affordable due to limited tract capacity.

f2: upkeep(c) ∈ [0, 1]



(B) This score measures the occupancy level of a tract.

f3: attractiveness$_a$(c) ∈ [0, 1]



(C) This score takes into account 1) nearby amenities and 2) community fit.

$$\text{Cost}_a(c) = 1 - \left[\text{Affordability}_a(c) \cdot \text{Upkeep}(c) \cdot \text{Attractiveness}_a(c)^{1/m}\right]$$

Preliminary Results

- We continue to refine details about the simulation framework, however initial results and data generated from our simulations look promising
- Agent probability distributions line up with amenity density, implying that agents are seeking out tracts with higher attractiveness.
- Higher-endowment agents choose to live in small subset of wealthy neighborhoods
- Lower-endowment agents show more uniform preference of less wealthy tracts