

Myopia in Dynamic Spatial Games

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Motivation and Outline

Dynamic games of spatial competition on graphs can be used to model ride-sharing and taxi markets.

- Develop a model of games of dynamic spatial competition on graphs using tools from computational geometry
- Model agents that adhere to myopic best response (MBR) and examine the relationship between MBR and efficiency in games
- Apply model to study ride-sharing and make policy recommendations to ride-sharing platforms regarding how to reduce passenger wait-times

Model: Overview

In a dynamic game of spatial competition on a transportation network T , Lyft drivers sequentially choose their locations on a transportation network with the objective of maximizing their market shares

- Agents: Lyft drivers
 - Objective of Agents: Maximize market share
 - Objective of Social Planner: Minimize passenger wait-times
- Environment: Transportation network T , which consists of roads and intersections
- Timing: Dynamic game in which agents sequentially choose locations on the network (turn order can either deterministic or random)

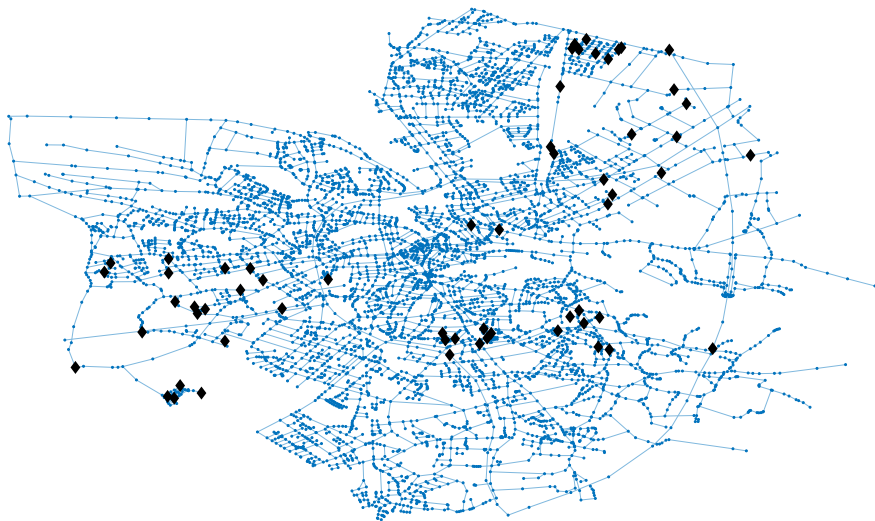


Figure 1: Initial allocation of 60 drivers in Oldenburg; $\xi(s_1) = 2.02$

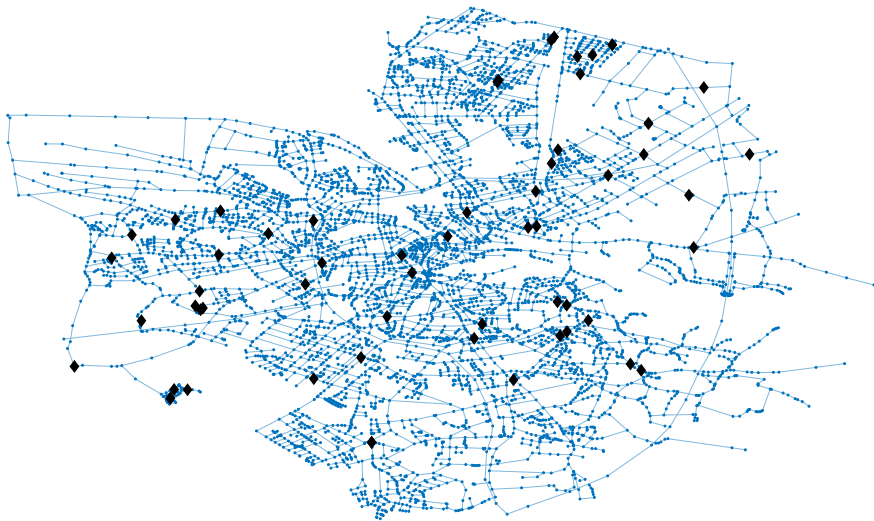


Figure 2: Final allocation of 60 drivers in Oldenburg; $\xi(s_{5000}) = 0.55$

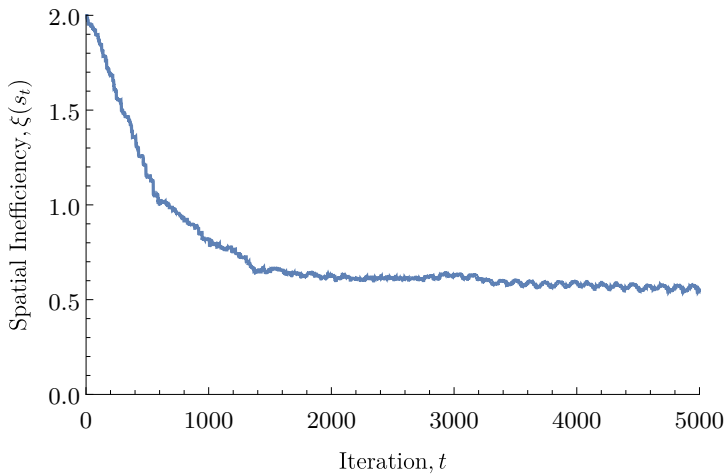


Figure 3: Spatial inefficiency along dynamic path of simulation with $T = 5000$

Application to Ride-Sharing Platforms

- MBR algorithm generally leads to large decreases in spatial inefficiency
 - Valuable for stochastic environments
- These results suggest that ride-sharing services may benefit from allowing idle drivers to observe the locations of other idle drivers on the spatial network, thus allowing drivers to compete spatially for passengers.
- Because the MBR algorithm generally decreases expected consumer wait-times, we believe that ride-sharing services may wish to allow drivers to see other nearby drivers and assist them in best responding to their neighbors.