Routing for Electric Vehicles

“Intention Aware Routing System with Variable Station Pricing”

1 Background

- The future of vehicles is **electric**
- Charging is **slow**, and leads to congestion
- Factor charging into **route planning**

2 Intention Aware Routing System

1. Plan route based on traffic information
2. Send route information to server
3. Server updates traffic information
4. Repeat steps 1-3 until route doesn’t change

3 Adding Pricing

- Algorithm does not include **charging price**
- Change utility function to include cost
- Utility function uses gamma (γ) to replicate individualistic driver behavior

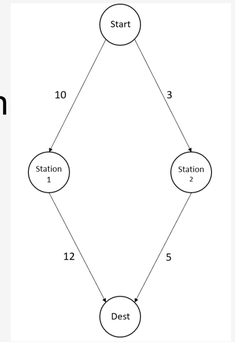
utility = γ * time utility + (1- γ) * price utility

Research question | **How can charging stations set their prices to minimize maximum congestion?**

4 Setup

- A simple first scenario with interesting results
- Only possible routes through either Station 1 or Station 2
- Station 2 will have a longer queue, due to shorter travel

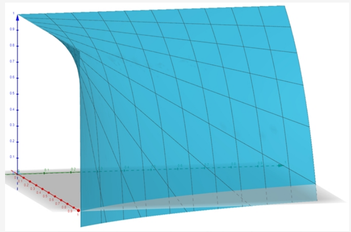
Solution
Lower Price of Station 1

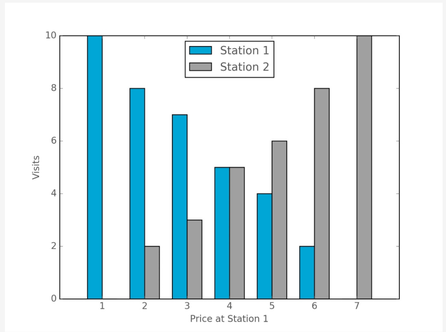


2 station bottleneck

5 Results

- Equal split for price 4
- Value predicted with formula
- Formula gave graph below


graph plotting price (blue) against distance (green) and γ (red)



Distribution of cars for different prices at Station 1 (for 2 station bottleneck)

6 Conclusion

- In relatively simple scenarios equal splits can be calculated
- Formula shows that some setups can't be solved
- More complicated graphs are not directly solvable

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