The Socioeconomic Impact of Missing Parking Availability Information

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Agenda

- Motivation - Impacts of Missing Parking Availability Information
- Solutions
  - parku
  - parkITsmart
  - Donostia-San Sebastian
  - SFpark
  - A CGE – Model of Parking in Zurich
- Conclusion
- Discussion

Motivation

Motivation

Evidence for Cruising for Parking

- 45% of traffic on 7th Avenue in Brooklyn, NY is caused by vehicles cruising for parking
- In SoHo 28% of all traffic
- Based on studies in 11 US cities:
  - 30% (average) of traffic in US cities for parking
  - 8.1 minutes of cruising in average
- Estimated 3650 vehicle kilometers traveled per parking space in a year

Negative Effects of Cruising for Parking

- Slows down traffic
- Contribute to traffic congestion
- Increases risk of traffic accidents
- Increases fuel consumption
- Contributes to air pollution
- Lost time of drivers
- Leads to external costs

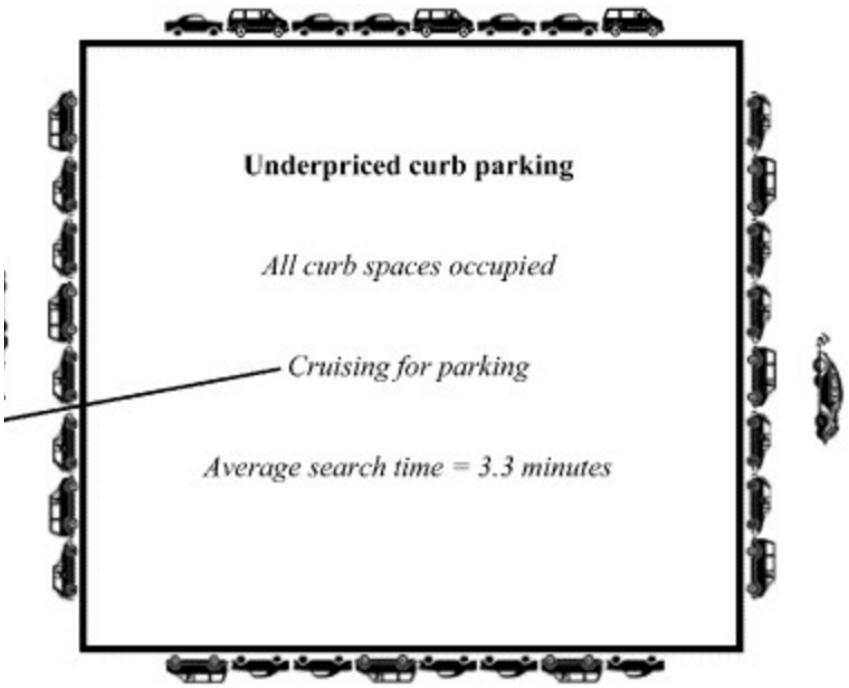
Motivation

On-Street vs. Off-Street Parking

- In many places parking information for off-street parking is available
- People still cruise for parking
- On-Street parking usually has more attractive
  - Location
  - Price
- Decision influenced by many factors
  - Time spent for searching
  - Price for fuel while cruising for parking
  - Price for parking space
  - Estimated time spent parking
  - Value of drivers time and other passengers in the car

Motivation

Why not just increase the prices?



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Motivation

Why not just increase the prices?

Low prices

- Traffic congestion: everyone wants to park on the street
- Waste of fuel: cruising for an empty space takes time
- Public Transportation is stuck in traffic too
- Probability of car accidents is higher
- Increase of pollution and noise

High prices

- Parking spaces remain empty
- Merchants lose potential customers
- This can lead to workers lose jobs
- City loses revenue
- Less money available for public services
- Social aspects

Solutions

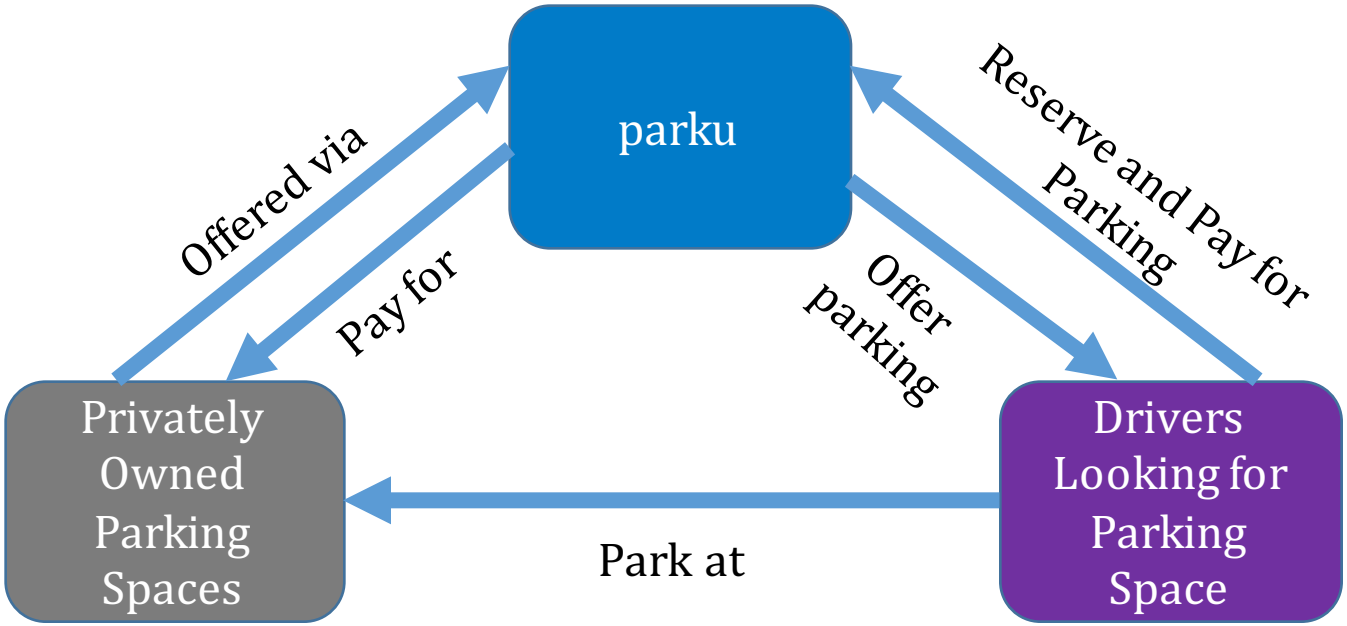
parku

[1]

- Approach:
  - Reserve parku parking space via app
  - Parking spaces are owned by third parties
  - Provision based
- About parku
  - Private company
  - Offers 5000 parking spaces in more than 15 cities
  - Active in Germany and Switzerland
  - Planned expansion to Austria and the Netherlands

parku

[1]


parku
Offered via
Pay for
Reserve and Pay for Parking
Offer parking
Privately Owned Parking Spaces
Drivers Looking for Parking Space
Park at

parku

[1]

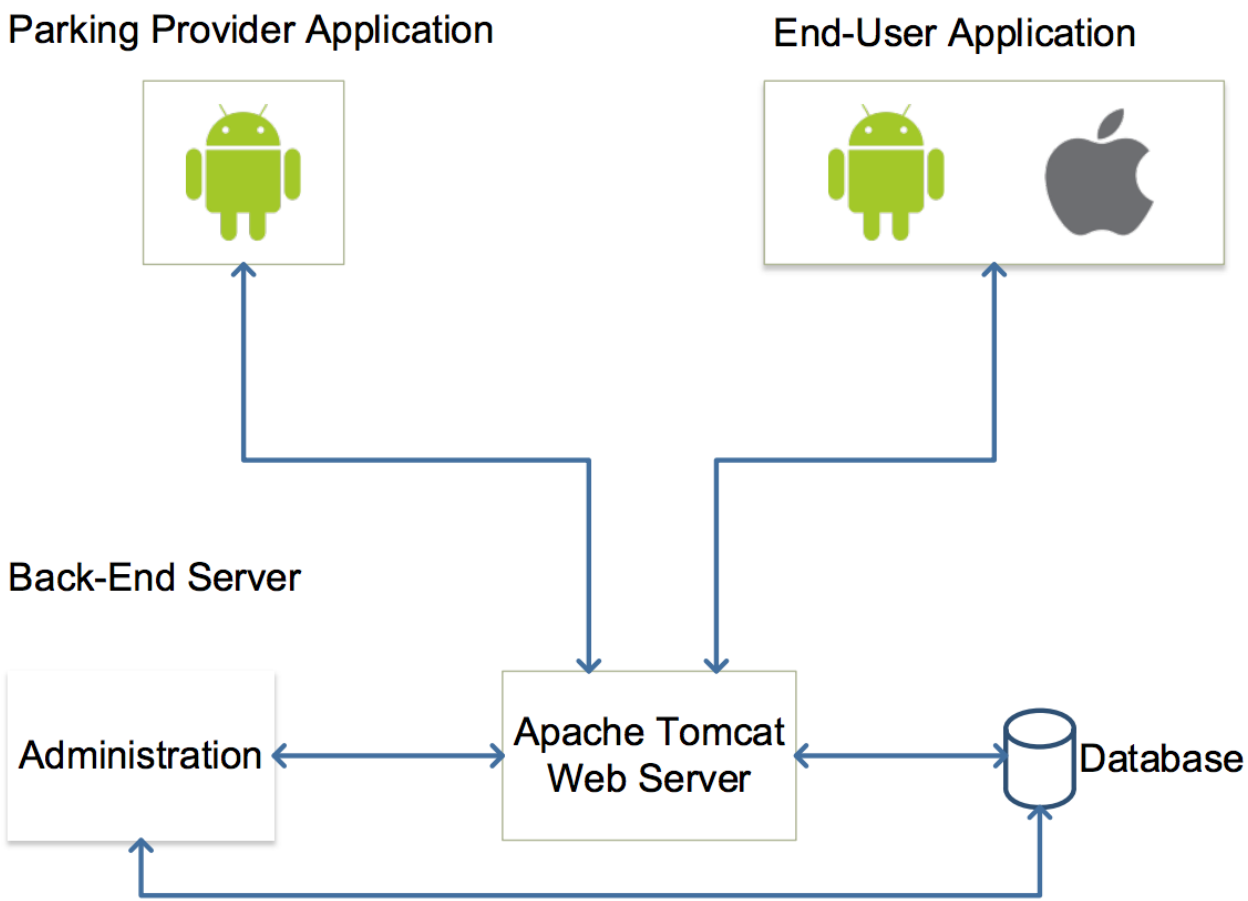
- Advantages
  - Easy to use and adopt
  - Additional layer to existing offerings
  - Market-driven

- Disadvantages
  - Limited parking offerings
  - Only shows availability of parku parking spaces
  - Scalability is questionable

parkITsmart

- Developed at CSG
- Provides parking availability estimations on map
- Collects and processed data from multiple sources
  - Smart phones
  - Smart cars
  - Parking providers
- Also includes app for parking inspectors
- Parking Monitoring and Management System (PMMS)

parkITsmart – PMMS



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parkITsmart - Applications

- End-User Application
  - Help driver find parking space
  - Delivers parking information on map
  - Shows position of parked car
  - Available on iOS and Android
- Parking Provider Application
  - Application for parking inspector
  - Can check NFC Tag / QR Code / manually for parking permit
  - Can send fines to holder of vehicles
  - Can send messages for holder of vehicles

parkITsmart - Evaluation

- Evaluation end-user application
  - Model
    - Grid, containing 10 x 10 squared
    - Each square encloses either free or occupied parking space
  - Comparison
    - Random routing
    - Routing with information
  - Result
    - Routing with information better than random routing
- Evaluation parking provider application
  - Increase efficiency for parking inspectors

parkITsmart - SAMS

- Specific Activity Monitoring System (SAMS)
- Extends end-user application
- Automatically update parking status
- Reduce need to interact with application and thereby improves data
- iBeacons
  - Gelo – beacon installed by drivers
  - Uniquely identifies car

parkITsmart – PSMS

- Parking Space Marking System (PSMS)
- Collect and digitalize parking spaces
  - Exact location
  - Orientation
  - Size
  - Regulations
- Data entry via
  - Parking inspectors
  - Crowdsourcing (end-users) → validation mechanism is required
- Improve parking inspector's controlling process
  - Makes use of iBeacons

parkITsmart – PAPS

- Parking Availability Prediction System (PAPS)
- Real–time & future parking availability information based on multiple data sources
  - Real-time controlling data
  - Real-time parking data
  - Historic data
  - Parking space location data
- Visualize availability information
- Improve likelihood of finding a free parking space

Donostia San – Sebastian

- Goal
  - Inform users about Park & Ride and the level of occupation
  - Inform users early so they have enough time to decide
  - Decrease traffic in general
- Approach
  - Improve parking guidance system
- Situation before
  - Only fixed signposts
  - Some indicating occupancy status with red or green light (only in inner city)

[8]

Donostia San – Sebastian

- Introduction of new signposts
- Parking availability signposts
  - Similar to current fixed signposts
  - But also show parking area
  - Direction
  - Occupancy status
- Placed along strategic Routes throughout city

[7]

Donostia San – Sebastian

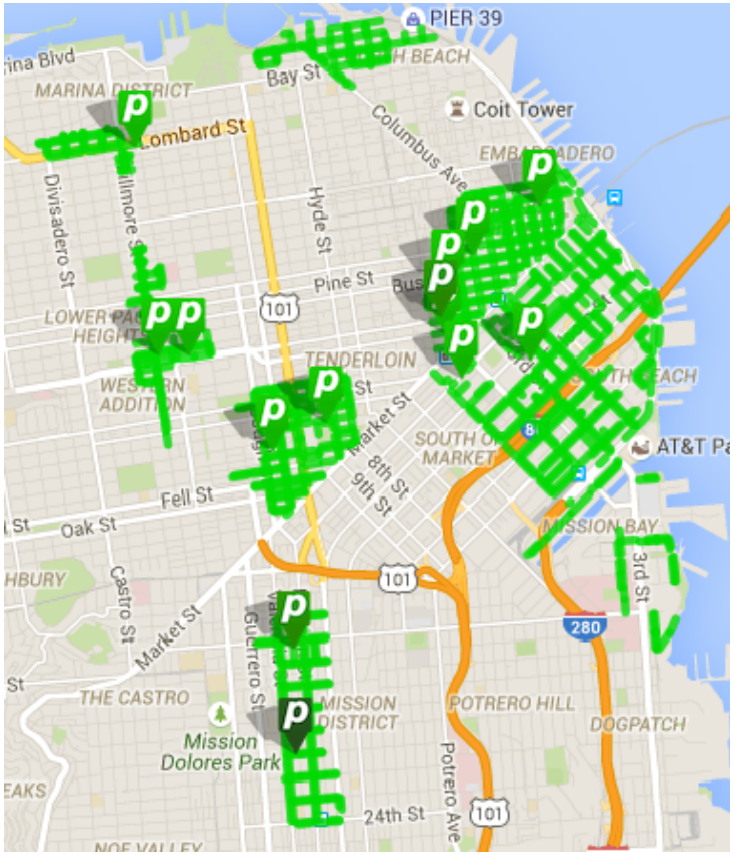
- Variable message signs
  - Computerized panels
  - Display 4 lines of text with 15 characters each
  - Red / Yellow / Green color coding
  - Parking Area / Direction / Occupancy status
  - Warnings and recommendations
- Placed at major entry points to city

[7]

Donostia San – Sebastian

- Acquisition costs of about 180.000 €
- Operation costs of about 6.000 € / year
- Decrease of CO2 omissions
- Decrease in number of cars entering the city
- Increase in public transportation usage

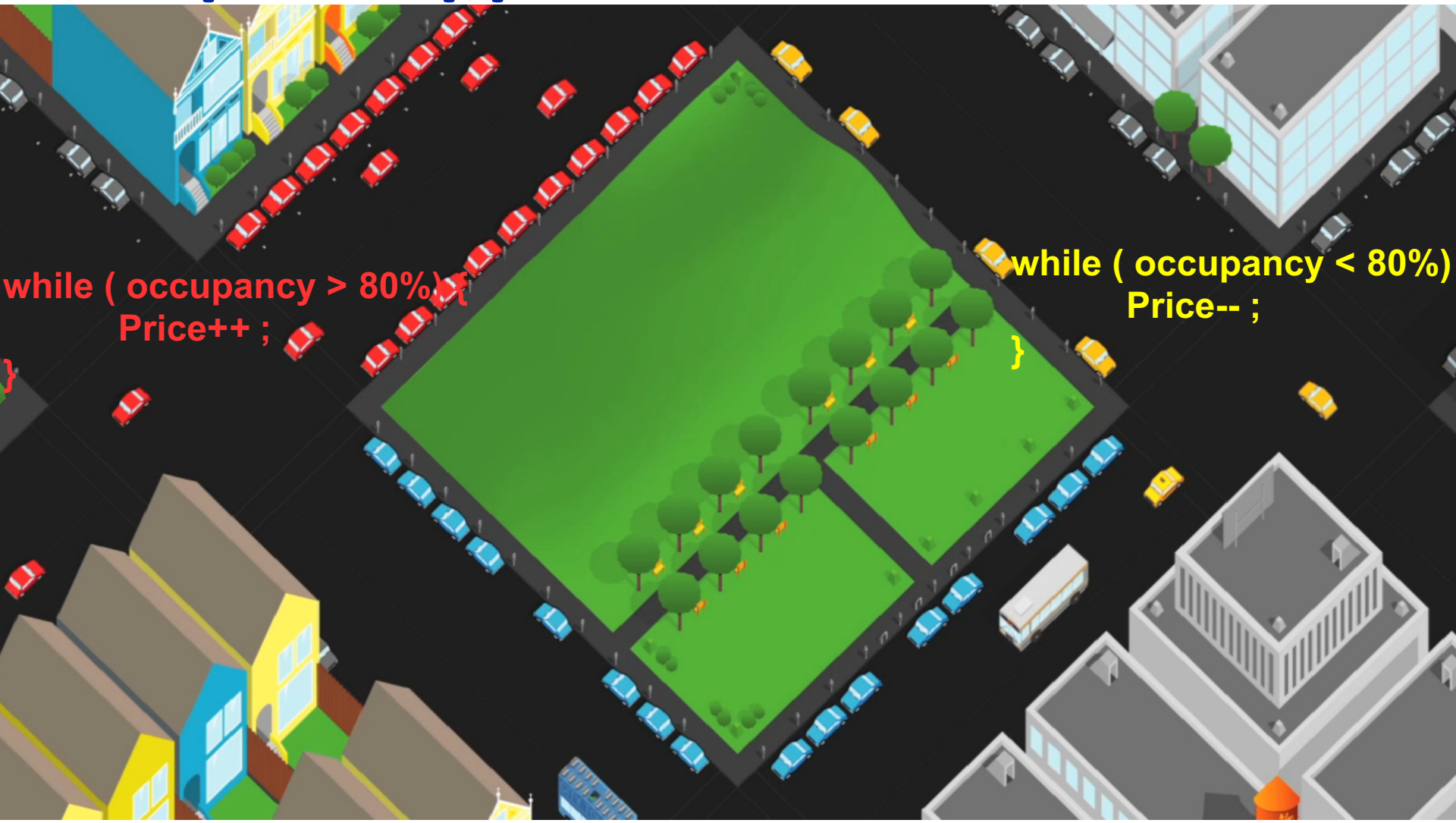
SFpark - Pilot Program April 2011



- 7 zones in San Francisco
- Sensors for every parking spot
- New park meters operating from 9 am to 6 pm
- Desired occupancy rate between 60% and 80%
- Minimum price: 25¢ / h
- Maximum price: $6 / h
- Every 2 months the new prices are published in the website

[2]

SFpark Approach



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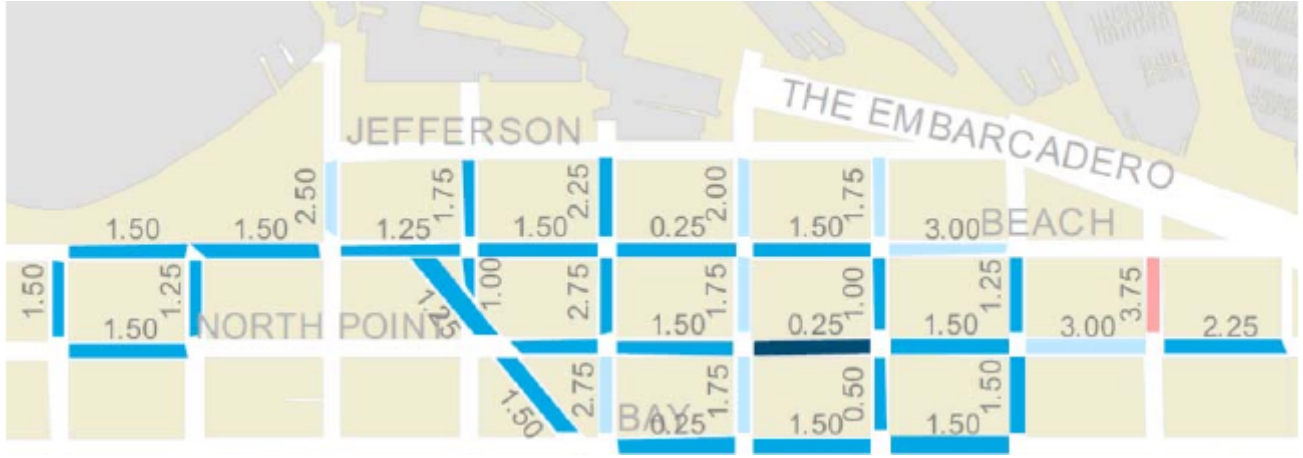
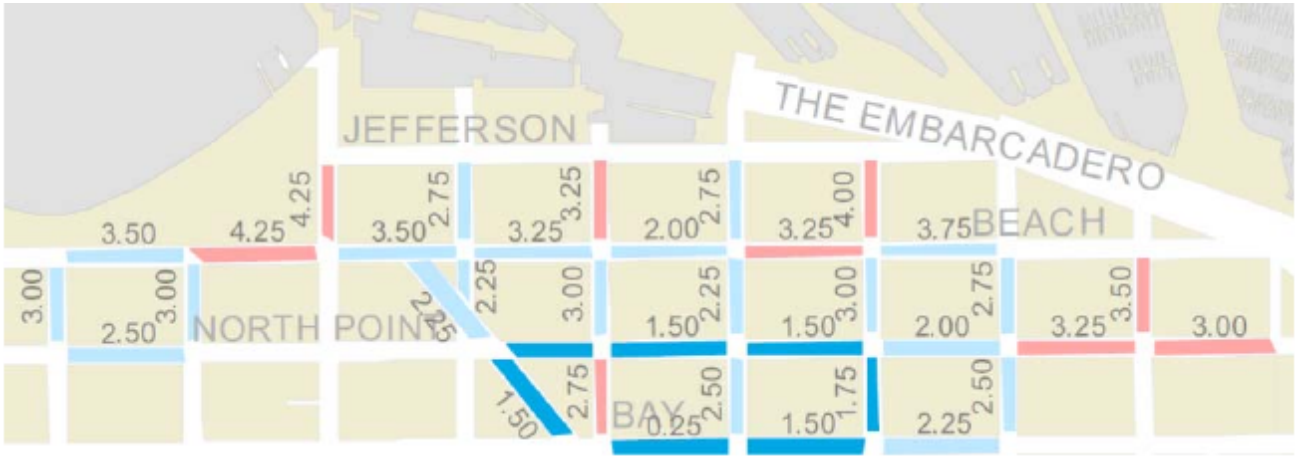
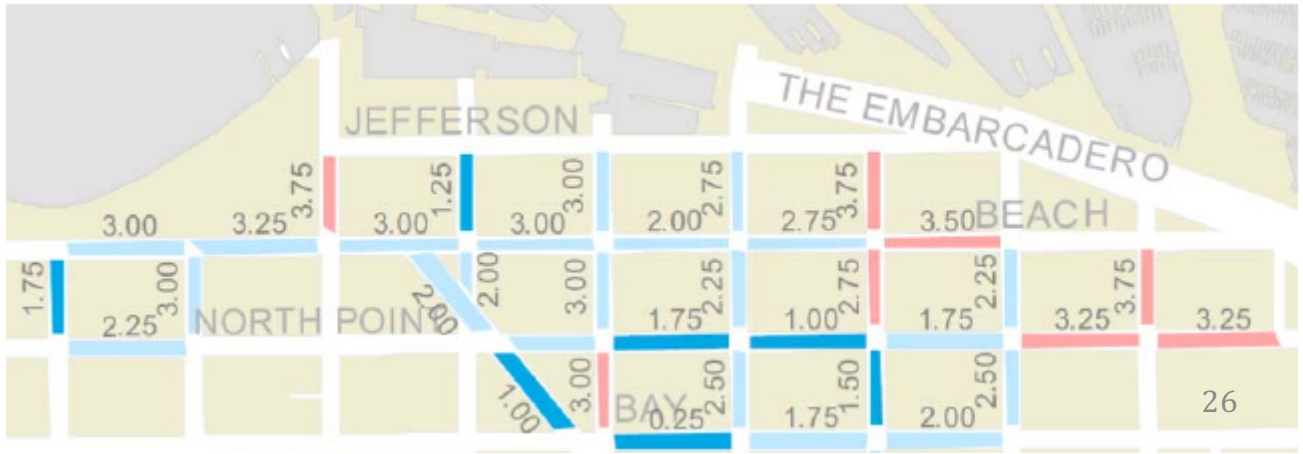
Before noon:



Noon to 3 pm:



After 3pm:



[3]

SFpark - Observations

Dependencies of prices

- Location
- Time of the day
- Day of the week
- Special events

Who will move first?

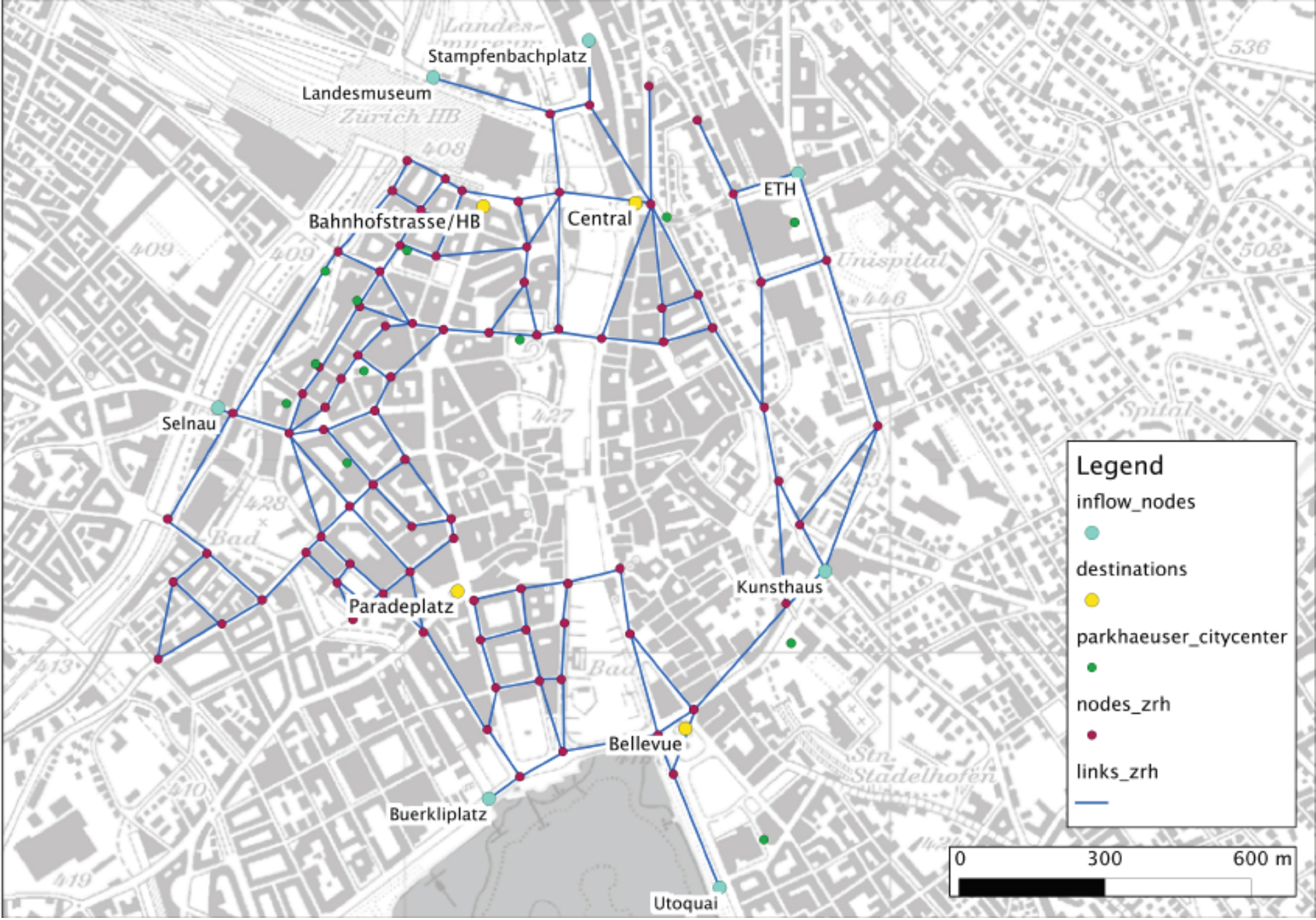
- Long term parkers
- Solo-drivers
- Drivers who arrive early at work
- Lower-income drivers who place a lower value on saving time

SFpark – Results After One Year

- There were six price adjustments (every 2 months)
  - 32% of the locations: Prices increased
  - 31% of the locations: Prices declined
  - 37% of the locations: Prices remained the same
- The average price fell 1% during the first year
- In terms of occupancy, there was a progress too.
  - Blocks with initial occupancy below 30% → 67%
  - Blocks with initial occupancy above 90% → 68%

CGE-Model - Can we implement the SFpark idea for Zurich?

- Master thesis of Anne-Kathrin Bodenbender: A CGE-Model of Parking in Zurich: Implementation and policy tests (July 2013)
- Create models to understand the impacts of new parking policies and examine the parking behavior.
- Basic idea: Observe a simplified street network in which agents search for a parking space in five different scenarios.



Simplified street network of Zurich [4]

CGE-Mode - Scenarios

Benchmark Scenario: Today's parking policy

- Fixed parking fee: on-street < off-street
- 80% of all on- and off-street parking are used
- Agents park 2 hours

Policy 1: Similar to SFpark

- Garage and street parking prices are adjusted
- Drivers can park at the desired location as long as they are willing to pay for it

Policy 2: Demand-responsive pricing for on street parking

- Garage fee = Benchmark
- On-Street parking price is adjusted so the probability of finding on-parking is 100%

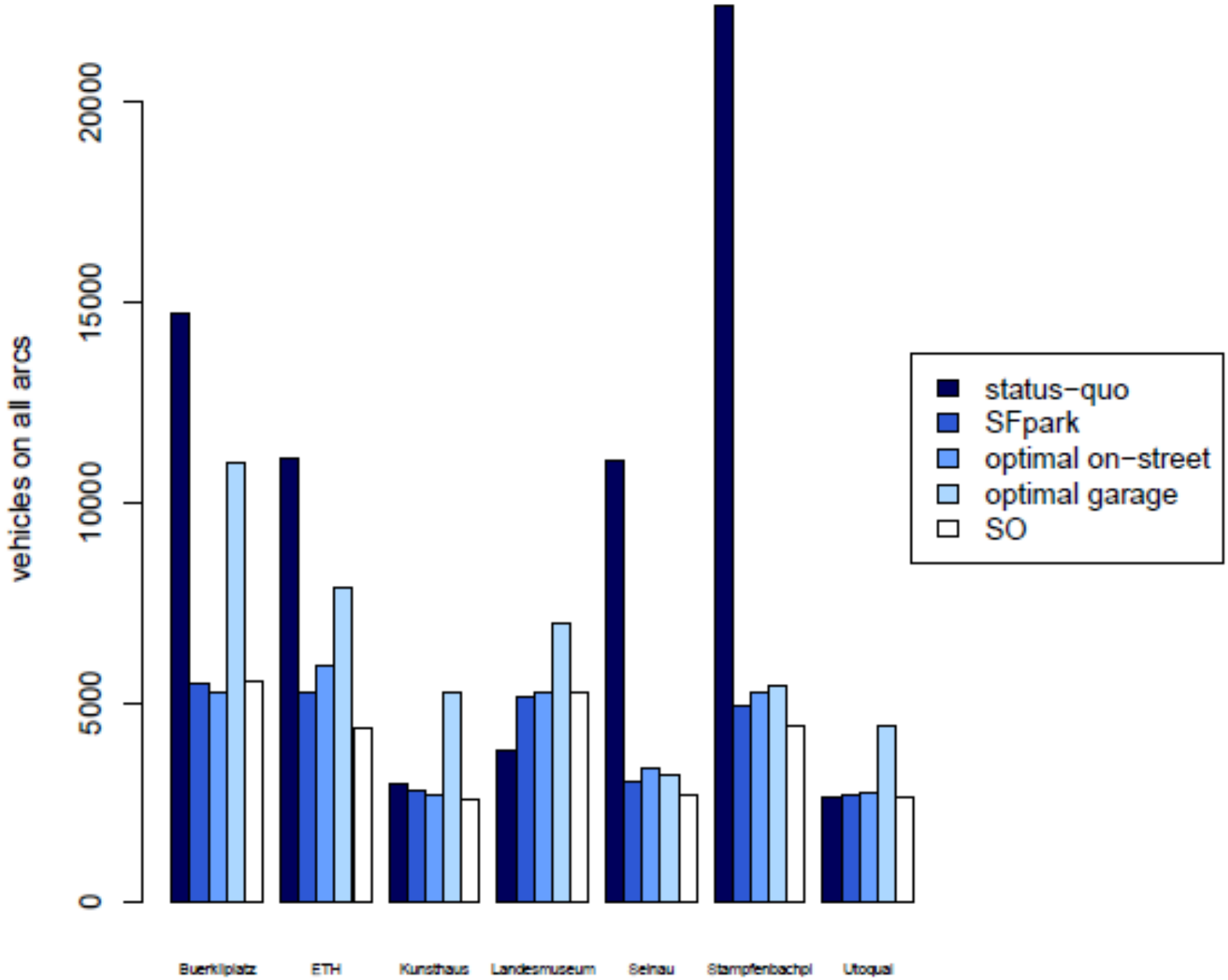
Policy 3: Demand-responsive pricing for on garage parking

- On-street parking fee = Benchmark
- Garage parking price is adjusted so the probability of finding garage parking is 100%

CGE-Mode – Scenarios continued

Social optimum scenario:

- Garage fee = benchmark
- On-street parking pricing is demand-responsive
- Every driver has enough money to pay the garage or on-street parking fees.
- Goal is to minimize the overall time cost in the system



Total trafffic volume by household [4]

Conclusion

Conclusion

- Current situation is not efficient and there is room for improvement
- Multitude of available approaches and solutions
- Huge variations in cost and time to implement the solutions
- Approaches tackle issue from different perspectives
- Difficult to compare solutions
  → It is unlikely that one solution fits all

Discussion

Providing Parking Information is wrong!

- It increases traffic - as people expect to find a parking space
- People should be given incentives to use alternatives – such as public transport, bicycles.

Does it make sense to spend money on a solution or will we be in the same situation in a few years due to increasing car numbers?

Is missing parking information a reason for not owning or using a car?

How can we motivate people to use parkITsmart and similar solutions
(Catch 22 Issue)?

Which solutions would you use and why?

References and Image Sources

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Other Resources

- Plus/Minus Bullet Points from https://pixabay.com/en/plus-minus-icons-symbols-red-24572/ [CC0 Public Domain]