The ICT Future of Parking

Itzhak Benenson[1], Nadav levy[1]

bennya@post.tau.ac.il, ndvlevy@gmail.com

[1]Geosimulation and Spatial Analysis Lab,

Department of Geography and Human Environment, Tel Aviv University, Israel

http://geosimlab.tau.ac.il/

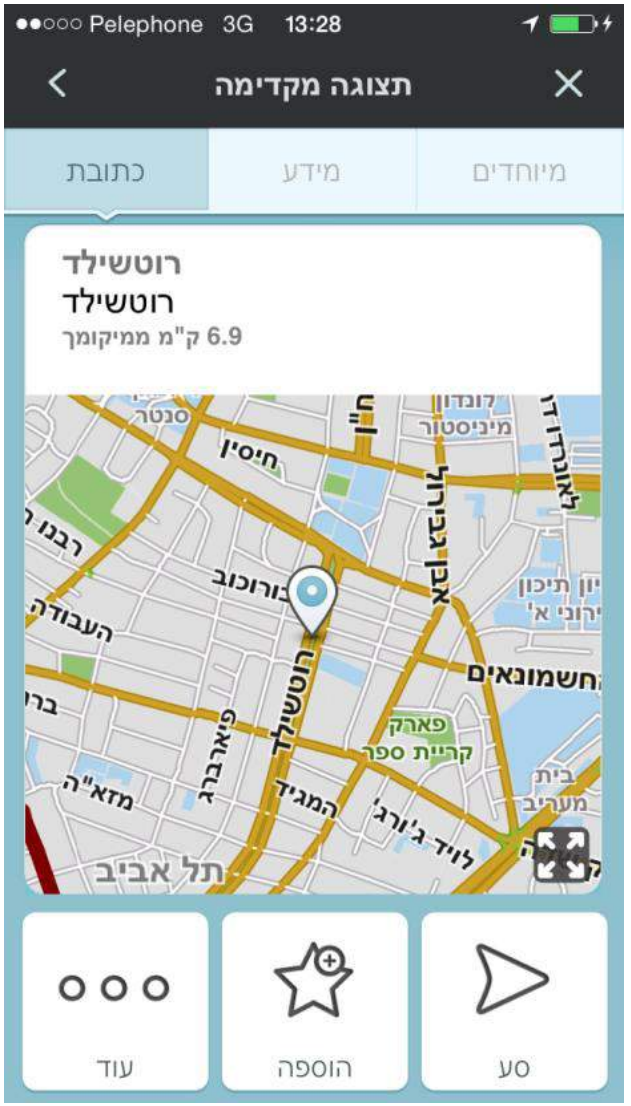
Transport ICT in action - CAR NAVIGATION SYSTEMS

However… you reached your destination – are you able to park?

Parking facilities at the destination may be unavailable or fully occupied.

Instead of completing the trip, the driver misses the destination, cruises for parking and, finally, parks at the first available lot, no matter how expensive and far from the destination it is.

ICT must take responsibility for the entire trip, getting close to the destination is not enough!



Big ICT Brother does provide tools for dealing with a trip as whole. Namely, ICT supplies:

- *Information on all parking facilities*
- *At a resolution of a single parking place*
- *That is updated in real-time*
- *And at a known level of uncertainty*

Are we ready for his help?

ICT PARKING SOLUTIONS ARE MANY

1. ICT-based advising
   A. Static map of the parking lots and prices
   B. Static map of the on-street parking facilities and prices
   C. Pay with your mobile phone
2. ICT-based regulation
   A. “Double parking” – reuse of temporary vacant parking facilities
   B. On-/off-street parking sensors and adaptive prices
   C. Supervised cruising for parking
3. ICT-based social networking
   A. I’m holding parking place for you
   B. Let us exchange information on parking availability

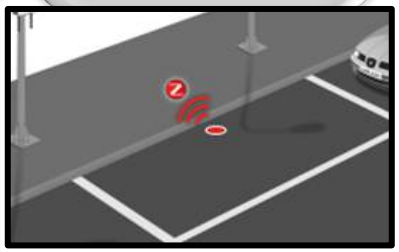
What is their efficiency?

ICT in PARKING

Real-time Signpost Systems

Pay-by-cell

Sensors



Mobile applications

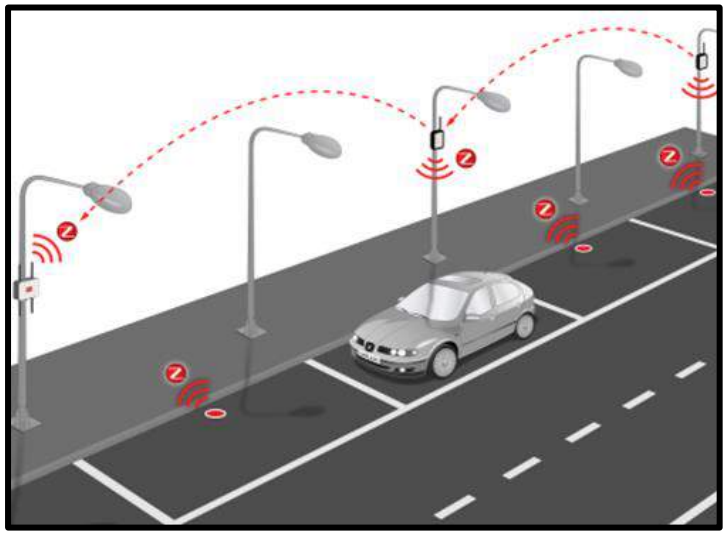
The outline

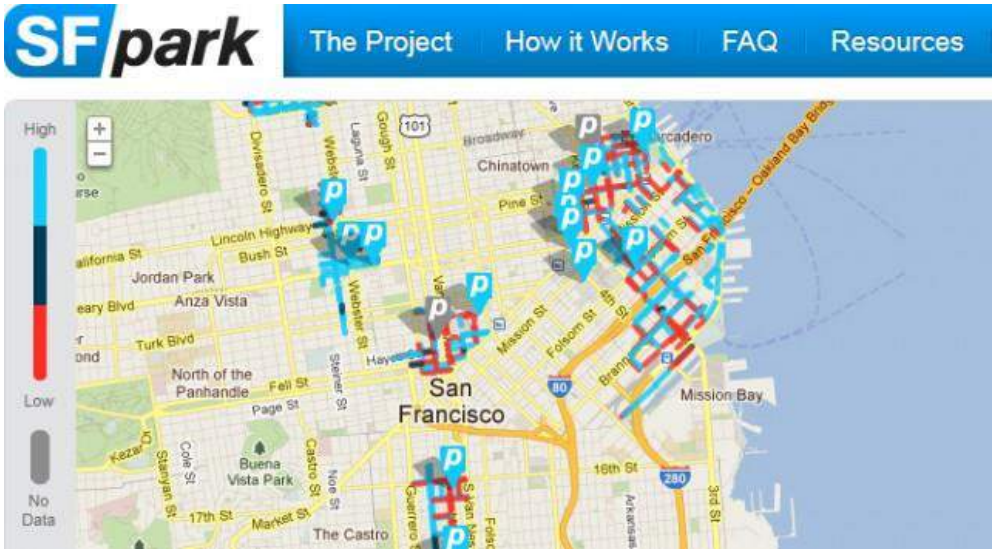
- *Best ICT-based practice:* **SFPARK**
- *From the hardware to software solutions:* **STATE-OF-THE-ART**
- *Testing ICT efficiency*: **AGENT-BASED MODELS**
- *Conclusions:* **OUR EXPECTATIONS FROM THE ICT**

Best Practice: San Francisco

Sensors → Adaptive parking prices

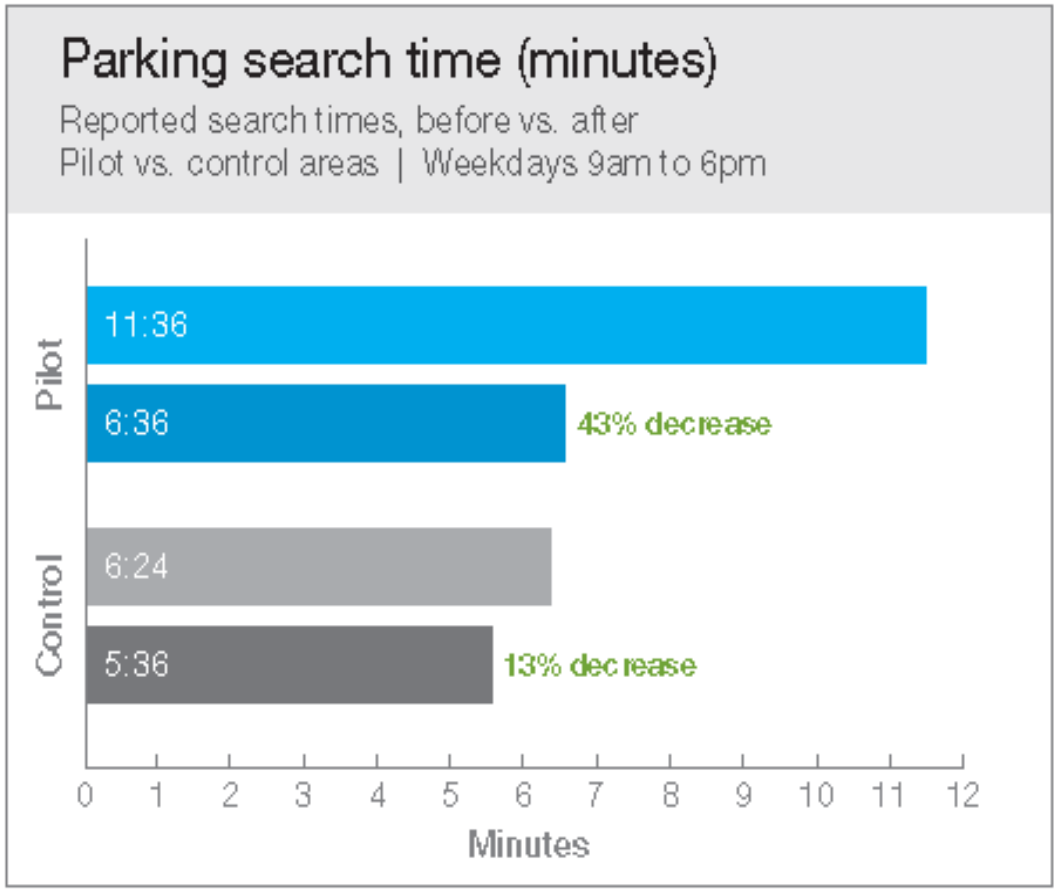
SFpark

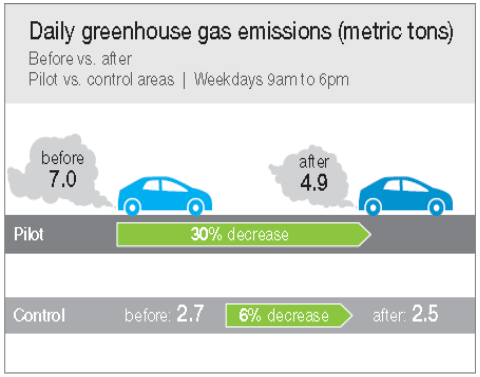


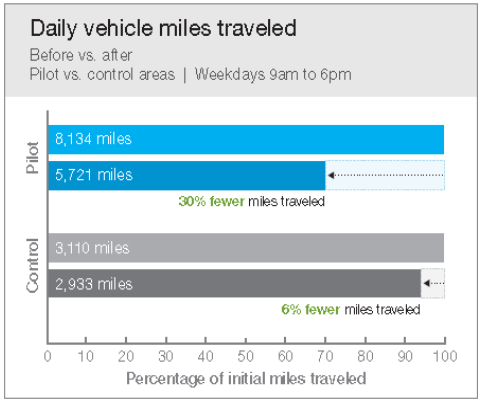


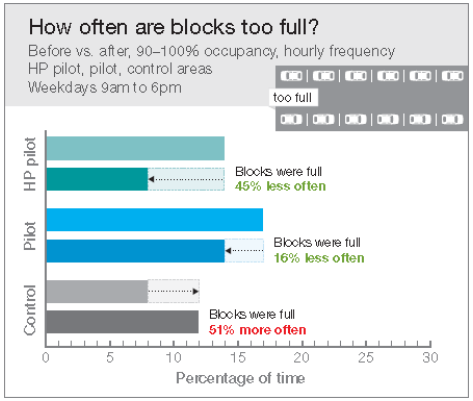
SF-Park really works!

SF-PARK reduced 43% search time, 30% mileage, 30% emissions!



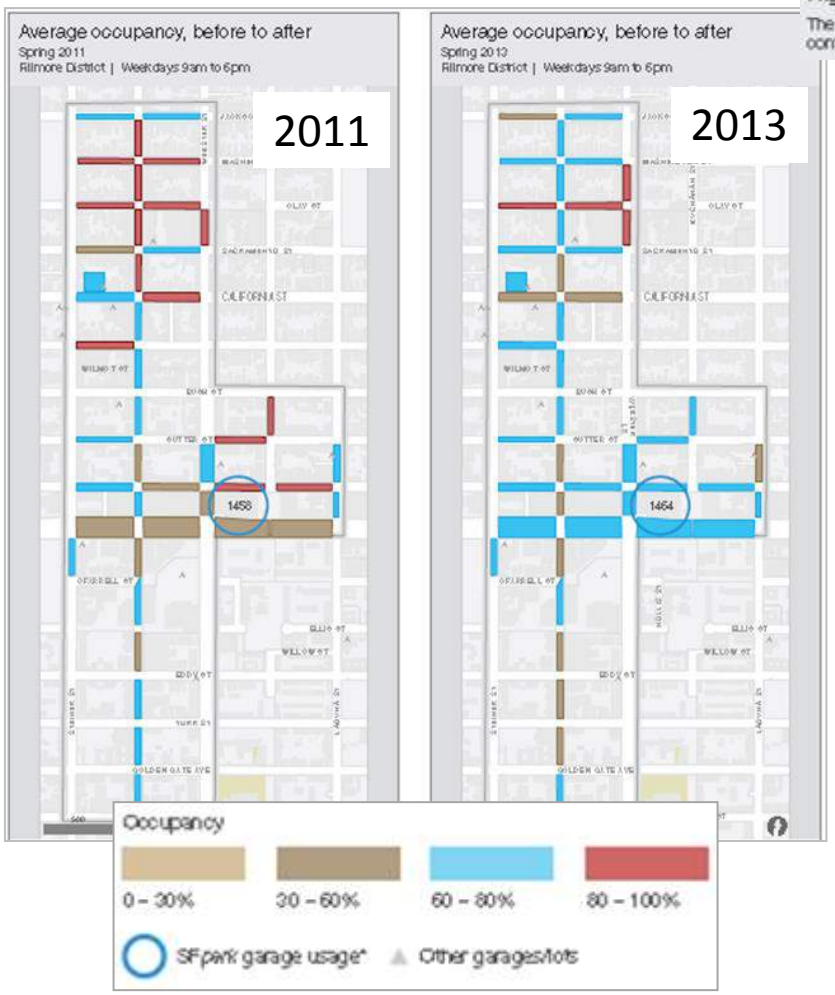




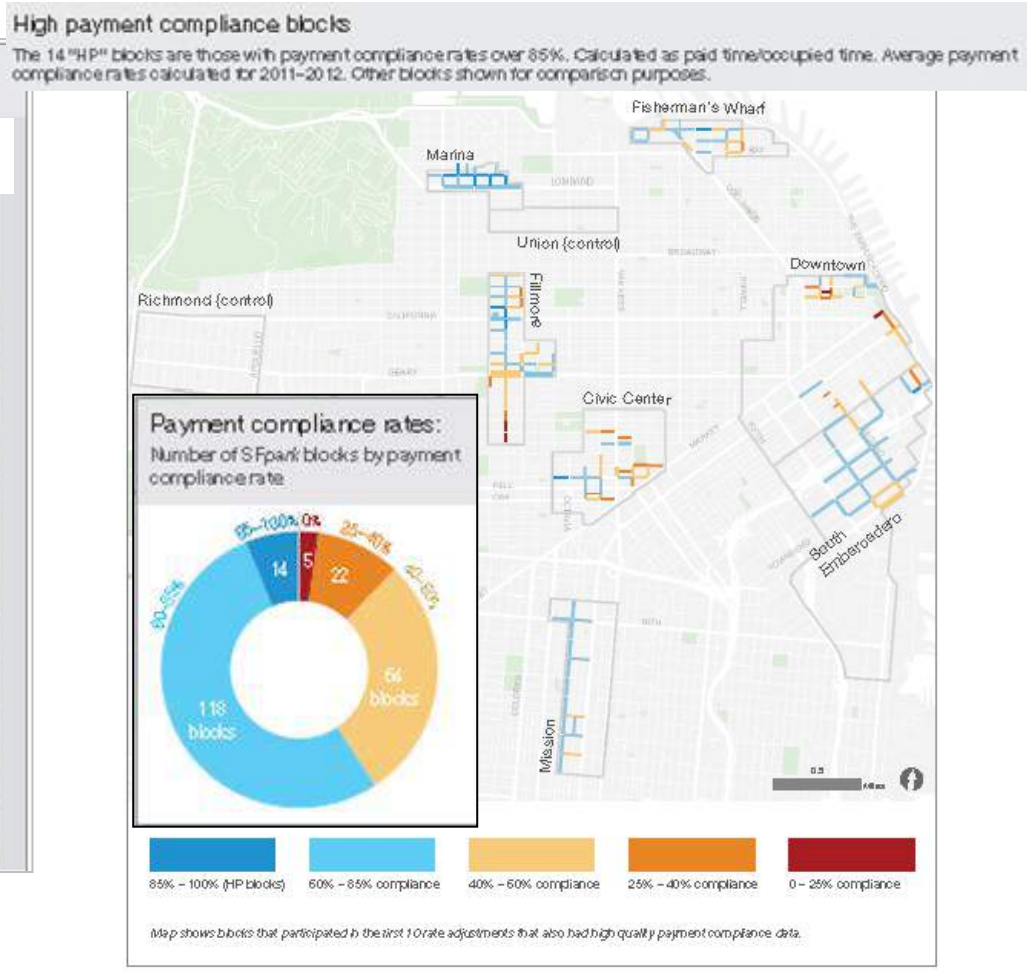


- **Millard-Ball, Adam, Rachel R. Weinberger, and Robert C. Hampshire,** Is the curb 80% full or 20% empty? Assessing the impacts of San Francisco's parking pricing experiment. *Transportation Research Part A: Policy and Practice* 63 (2014): 76-92.
- **SFMTA's evaluation of the SFpark pilot project:** http://sfpark.org/resources/docs_pilotevaluation/

Parking is a heterogeneous phenomenon!

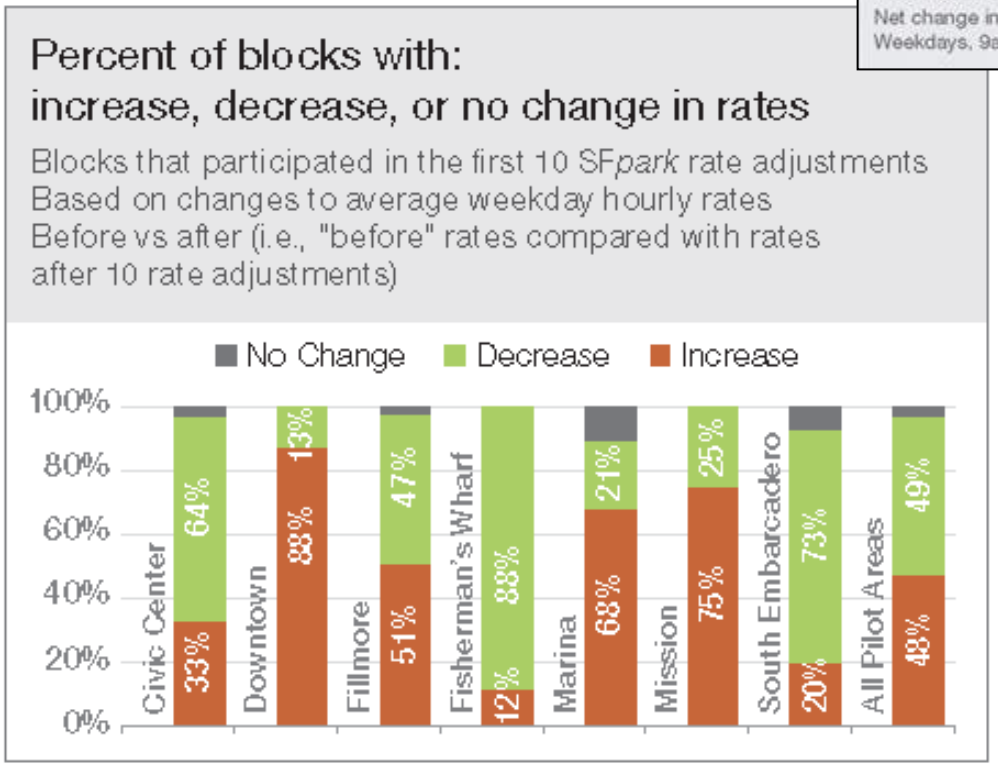


Occupancy
before and after

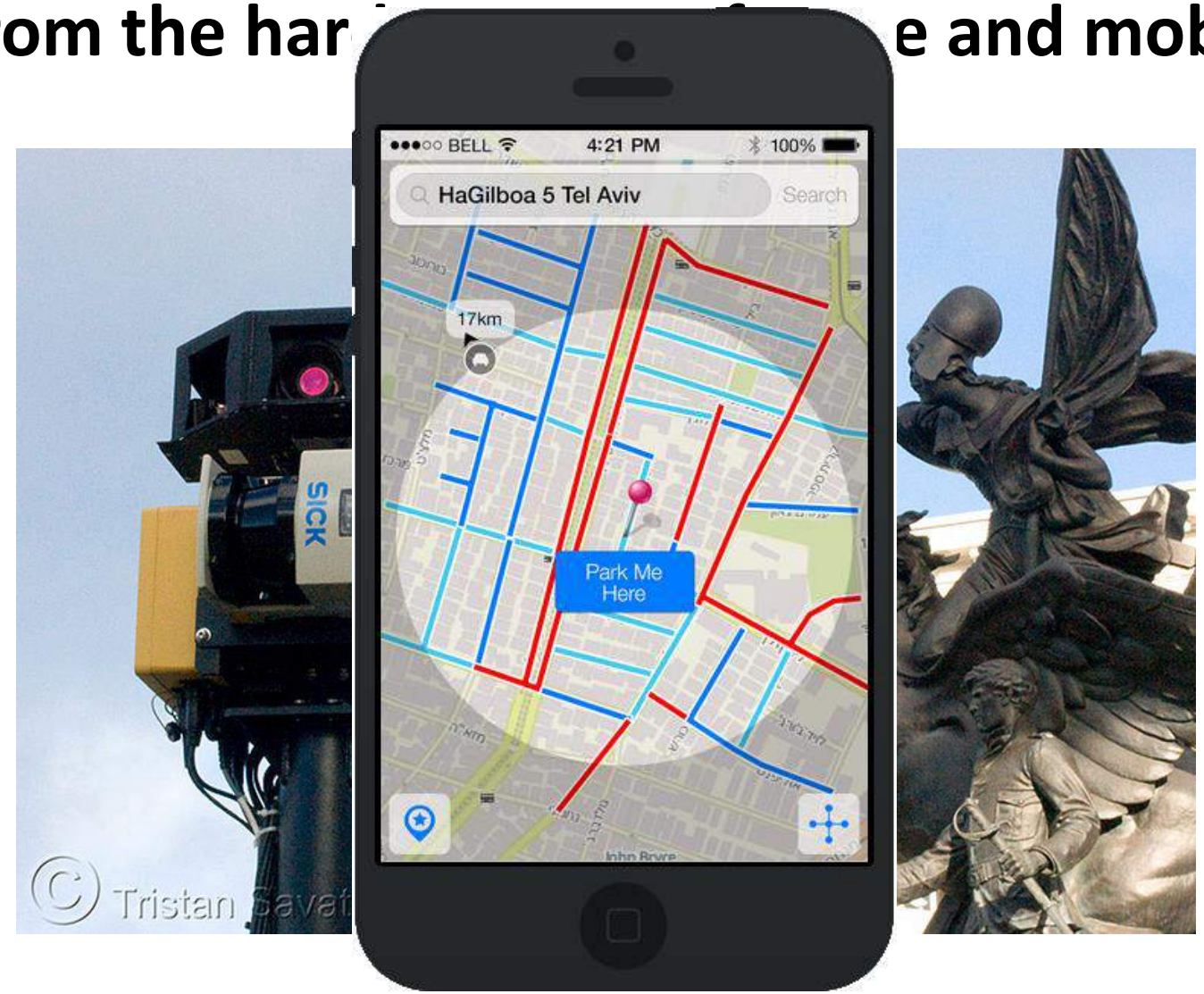


Readiness to pay is
heterogeneous too

To spread the demand uniformly we must react locally



ICT inherently fits for high-resolution management!
But should it always be as costly as the SF-Park is?
From the har e and mobile



Types of parking applications for the Smartphone

Type	Demands initial field survey	Demands Smartphone software	Forecasting capabilities	Reacts to real-time behavior of the others
*Reuse of privately owned	✓	✓	✓	✓
*Drive parkin				✓
*Infor parkin				✗
*Sens				✓
$Optir search				✗
				✓

IPI INTERNATIONAL PARKING INSTITUTE

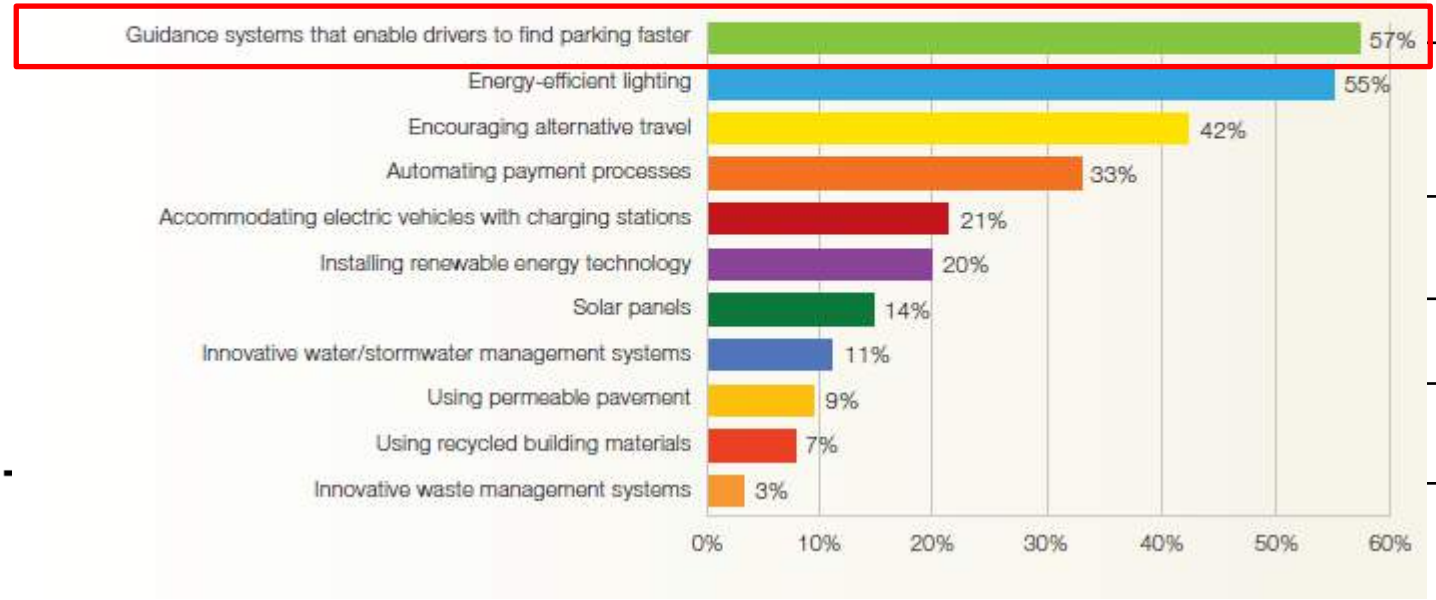
2013 Emerging Trends in Parking

Report on a survey conducted by the International Parking Institute

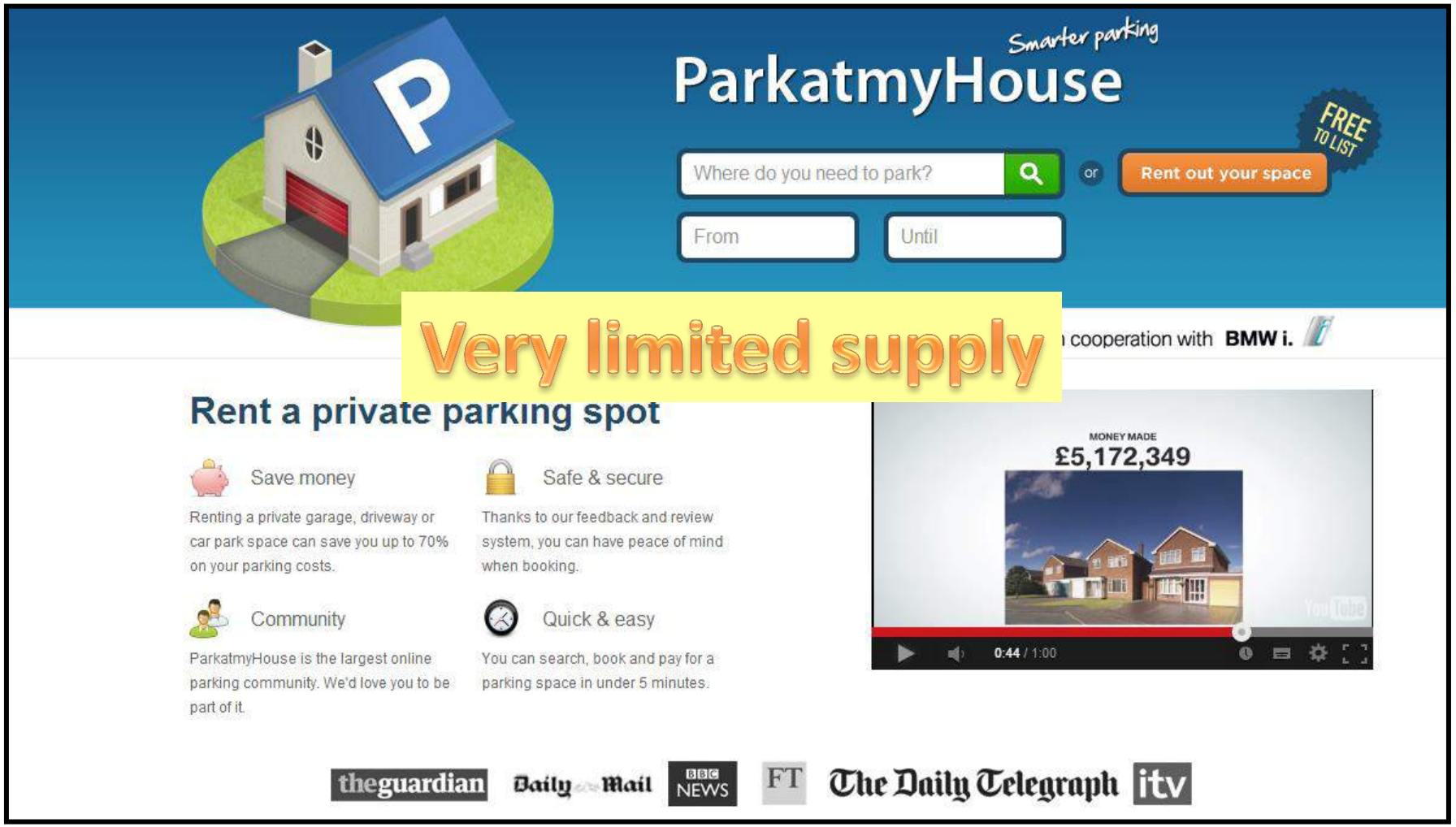
How famili … novations?

Sustainability, and Parking

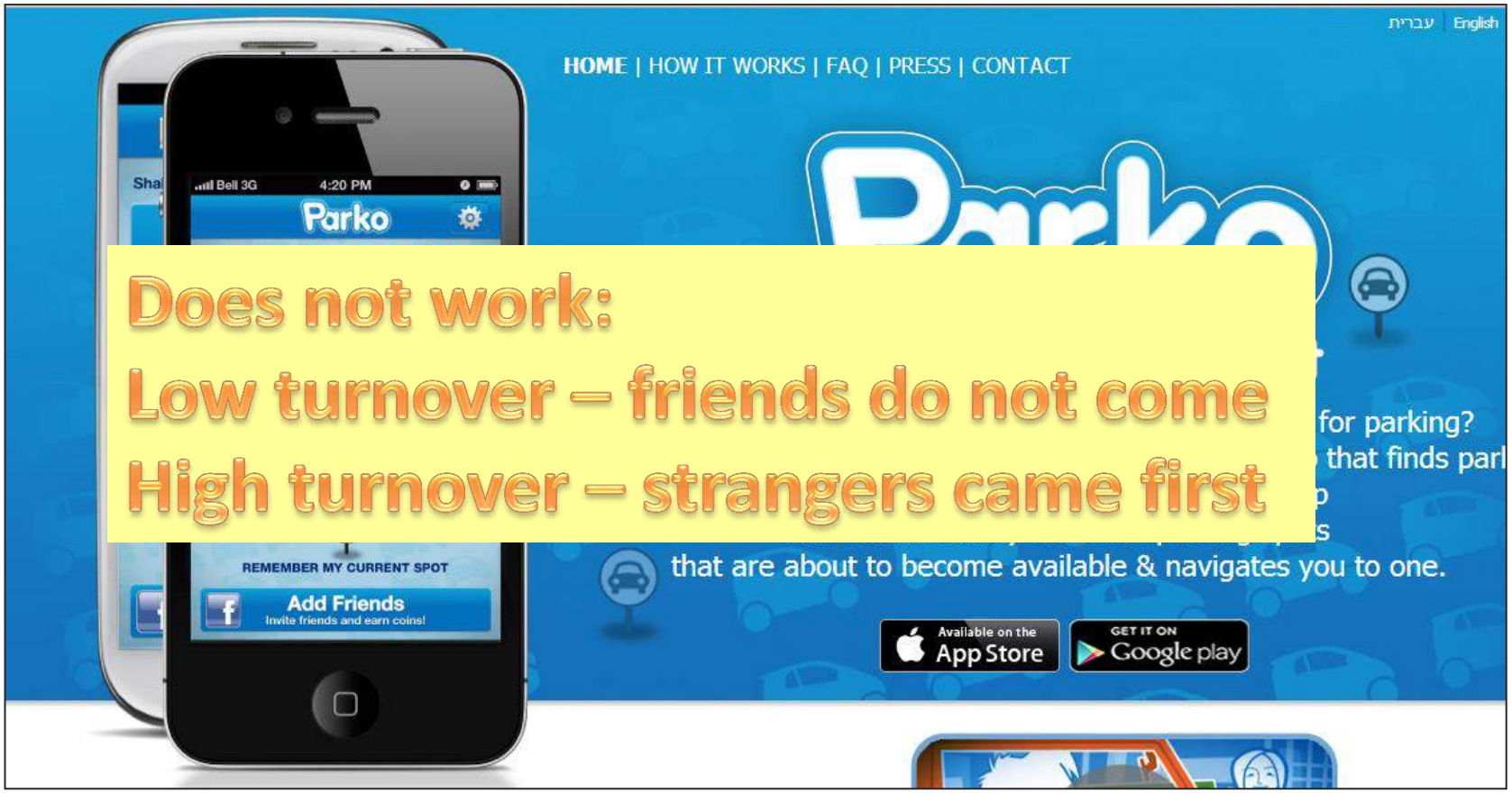
Which of the following do you believe has the greatest potential to improve sustainability in parking?



Reuse of privately owned parking: ParkatmyHouse.com

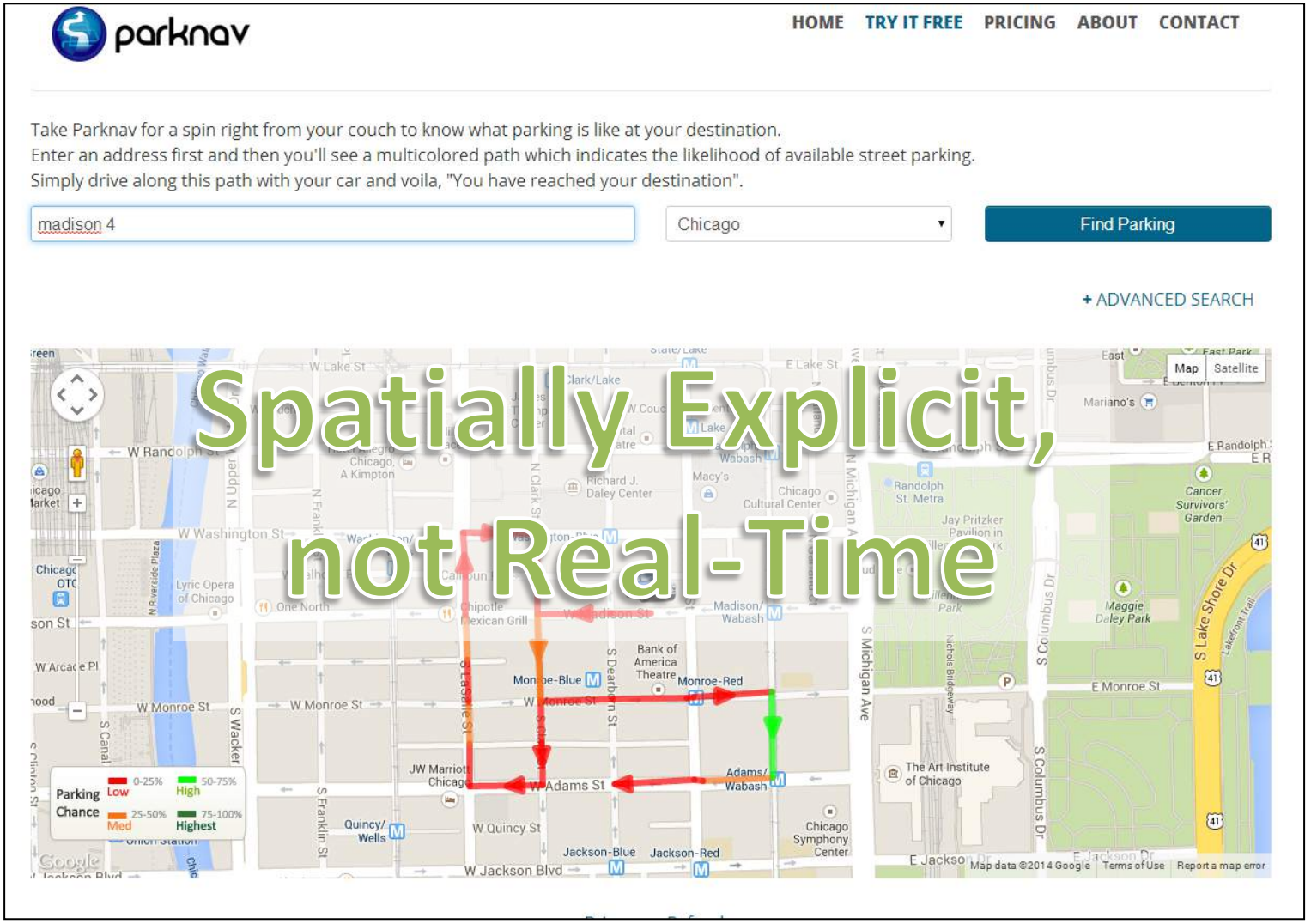


Community-based exchange of parking information: PARKO.com

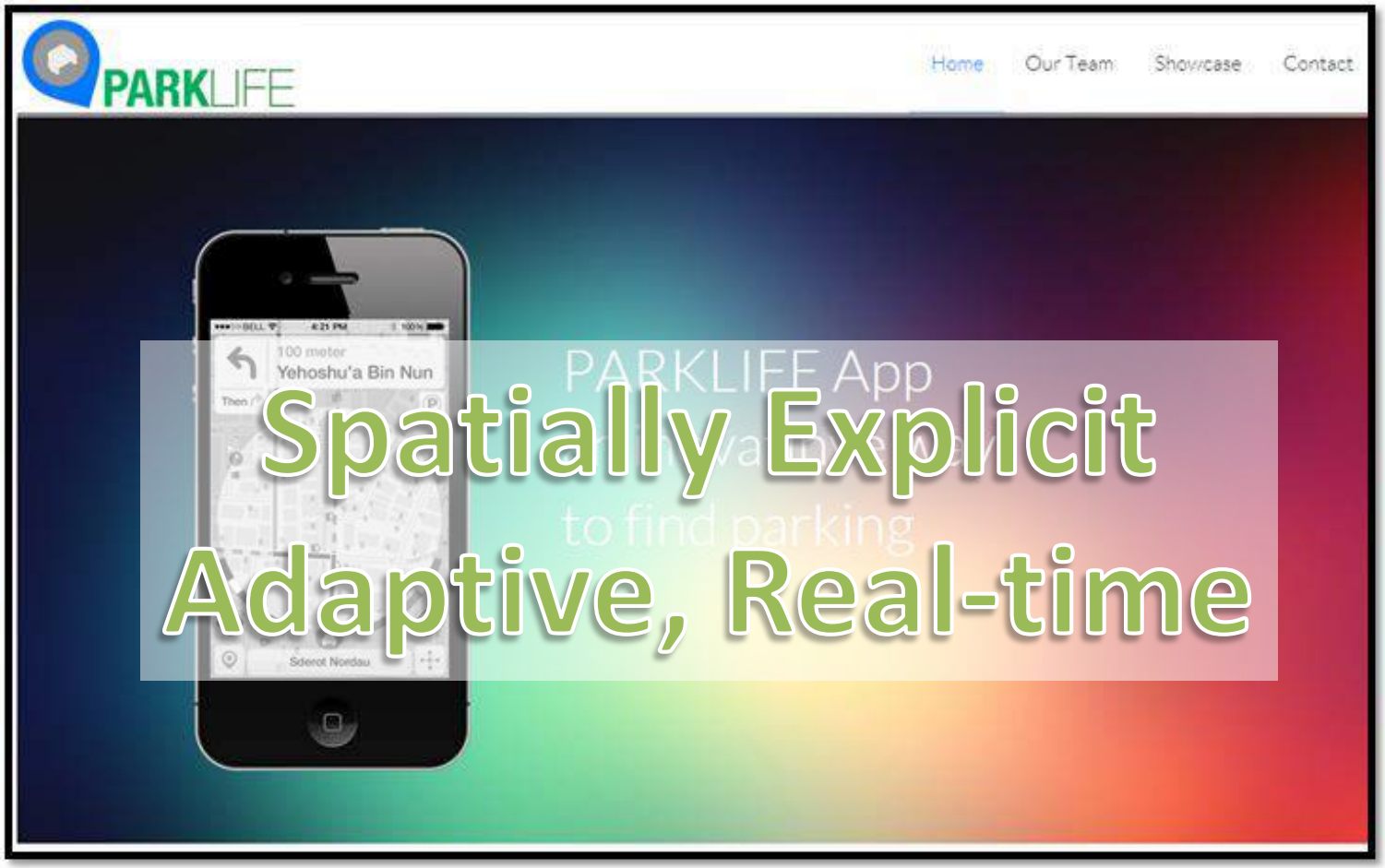


Parking lots prices and availability BestParking.com

Optimal Parking search: PARKNAV



Optimal Parking search: PARKLIFE



http://www.parklife.co.il/

Software based ITC solutions are cheaper than the hardware-based ones, but yet costly and not necessarily bounded to success…

Can we test them before implementation?

Yes, Agent-Based Modeling is the tool for such tests…

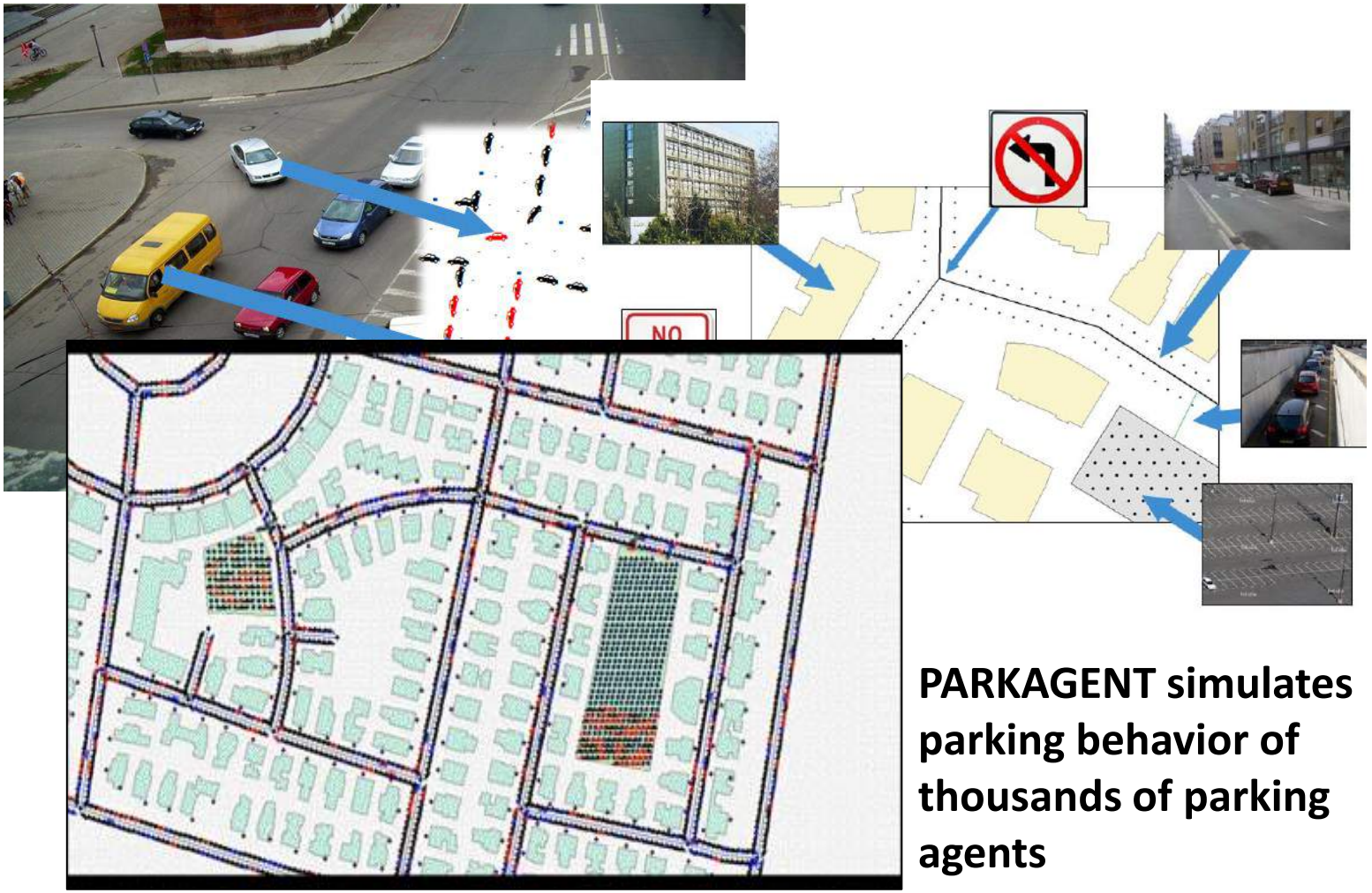
Our solution: PARKAGENT, an Agent-Based Model of Parking Search

Residents

Commuters

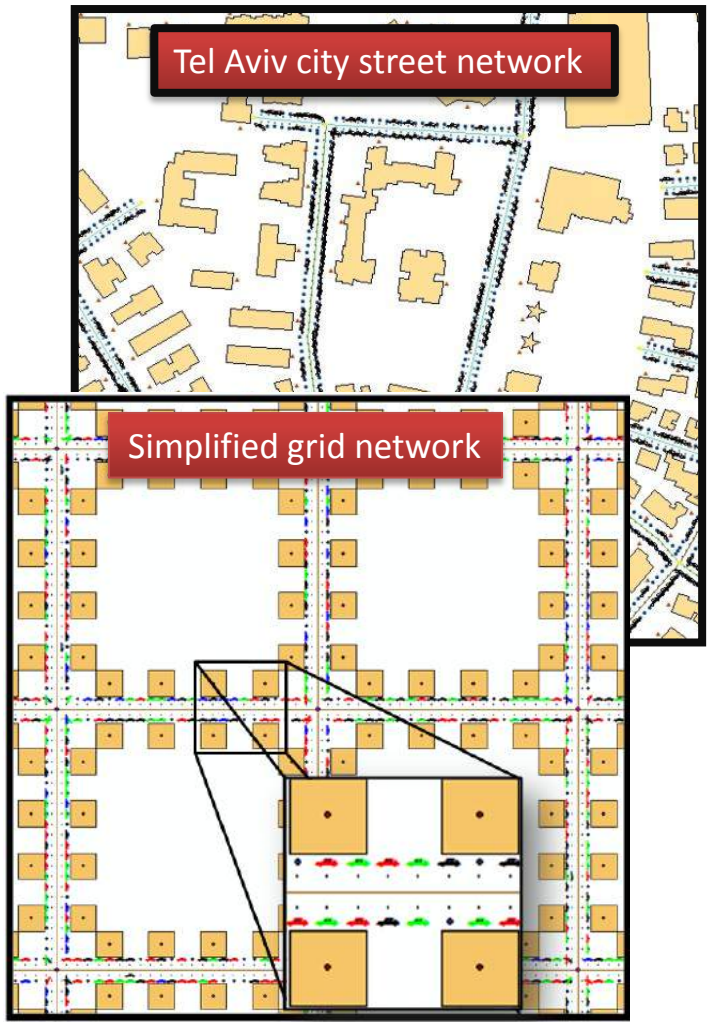
Guests

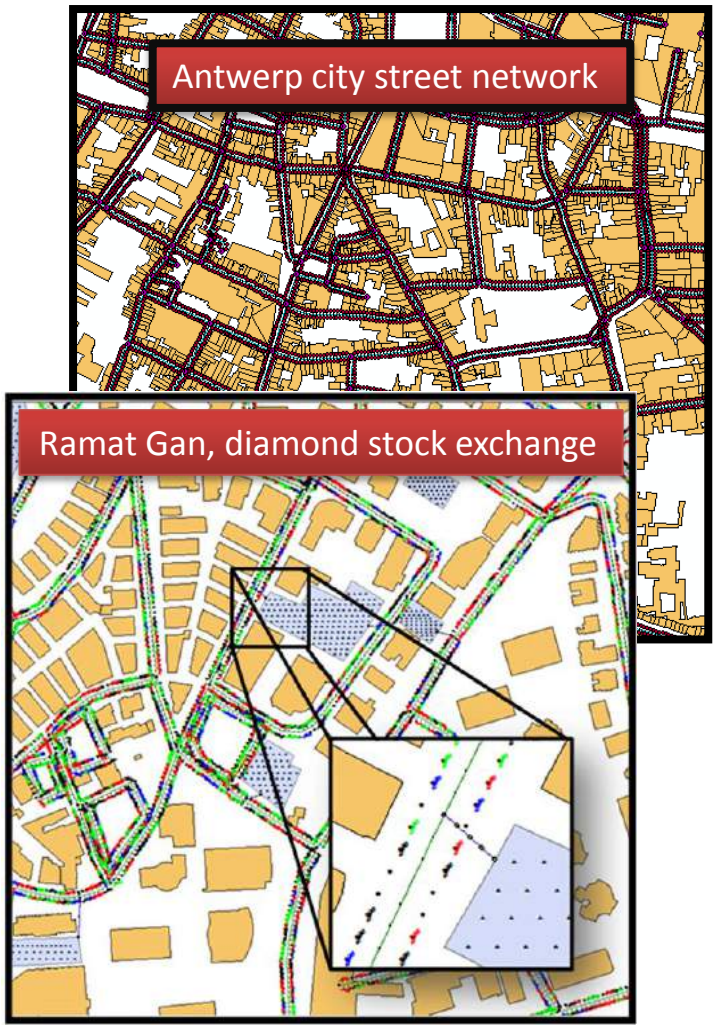
Customers



PARKAGENT simulates parking behavior of thousands of parking agents

PARKAGENT is easily adjustable





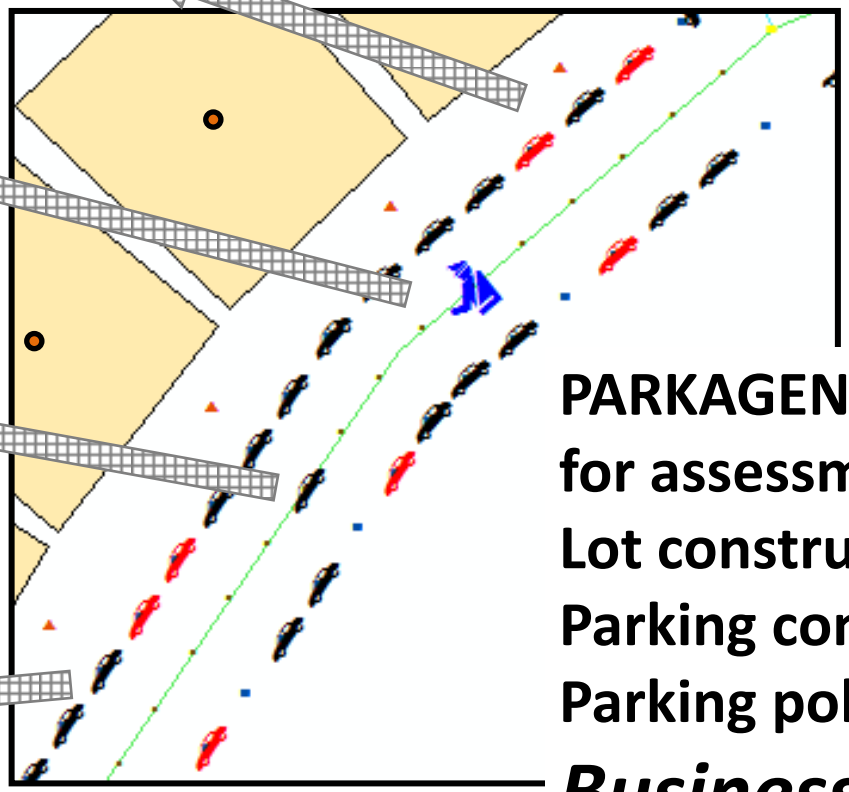
PARKAGENT imitates ICT tools and supplies all policy-important outputs:

Occupancy rate per street

No of issued tickets

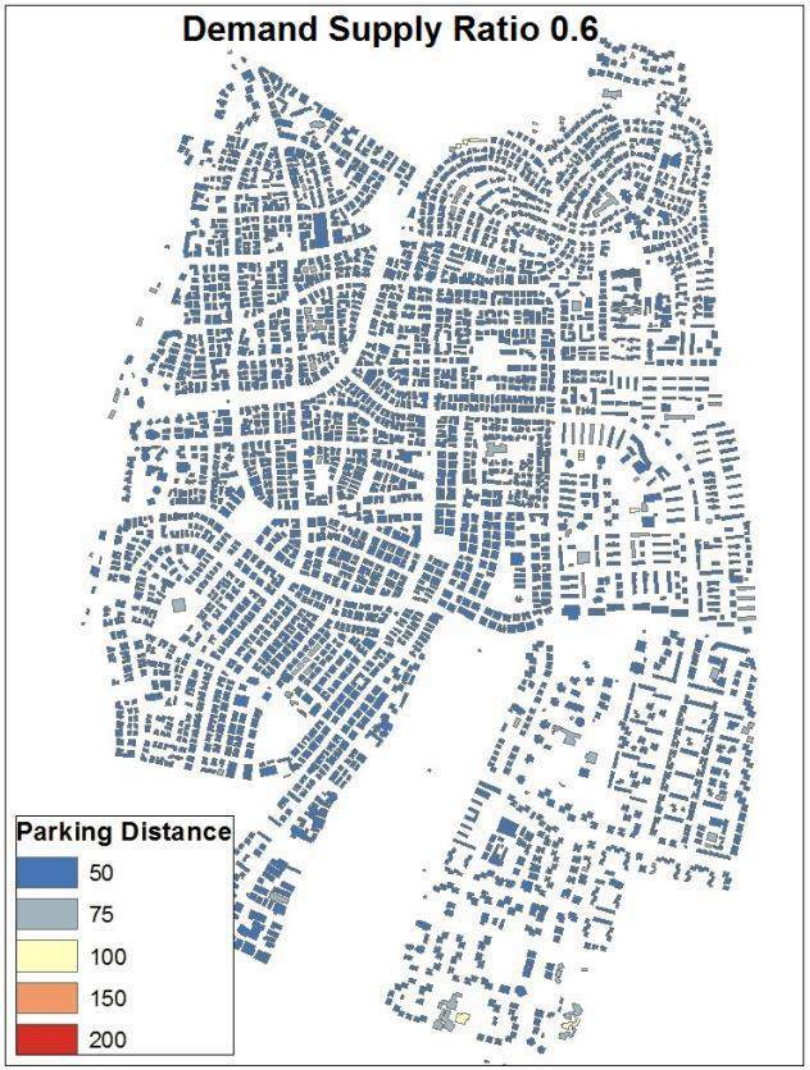
Cruising time

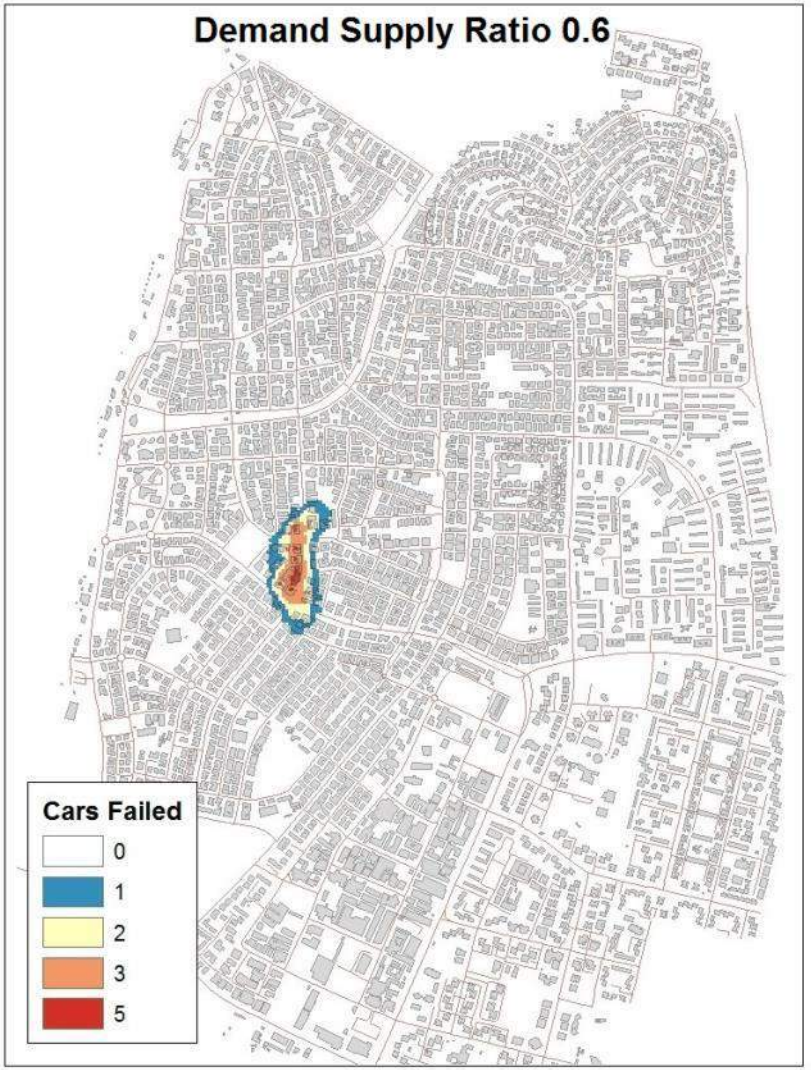
Distance to Destination



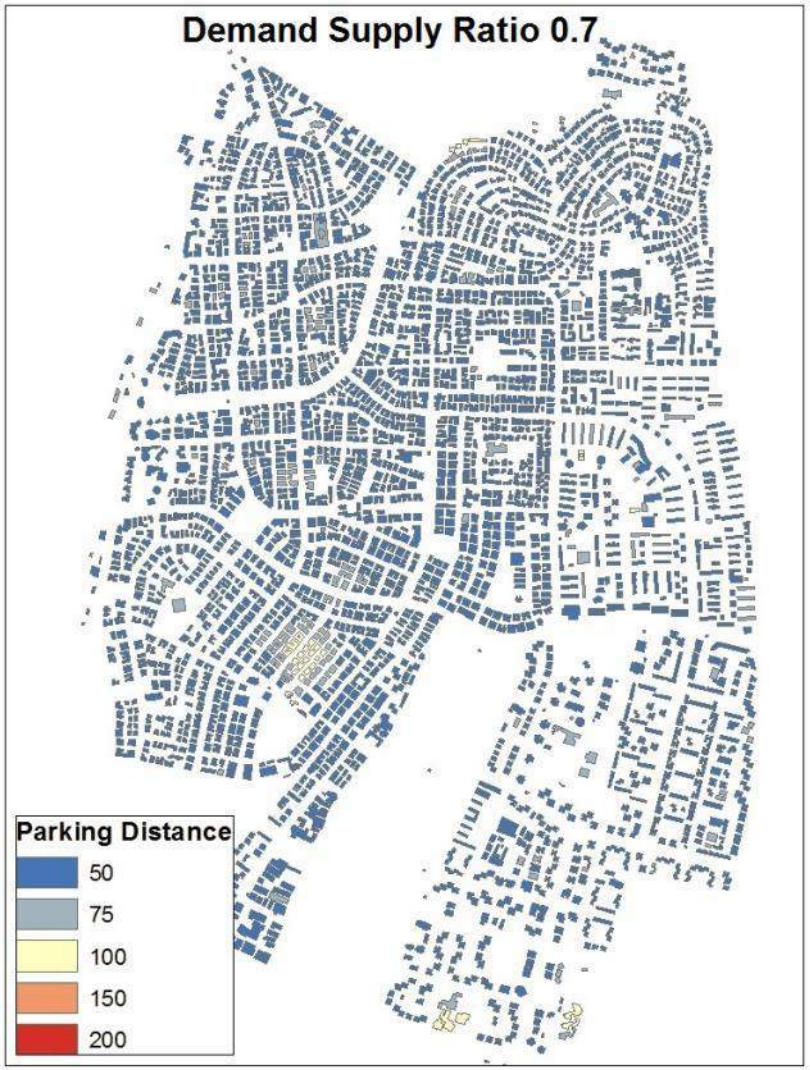
PARKAGENT was used for assessment of:
Lot construction projects,
Parking control,
Parking policy,
Business models
…..

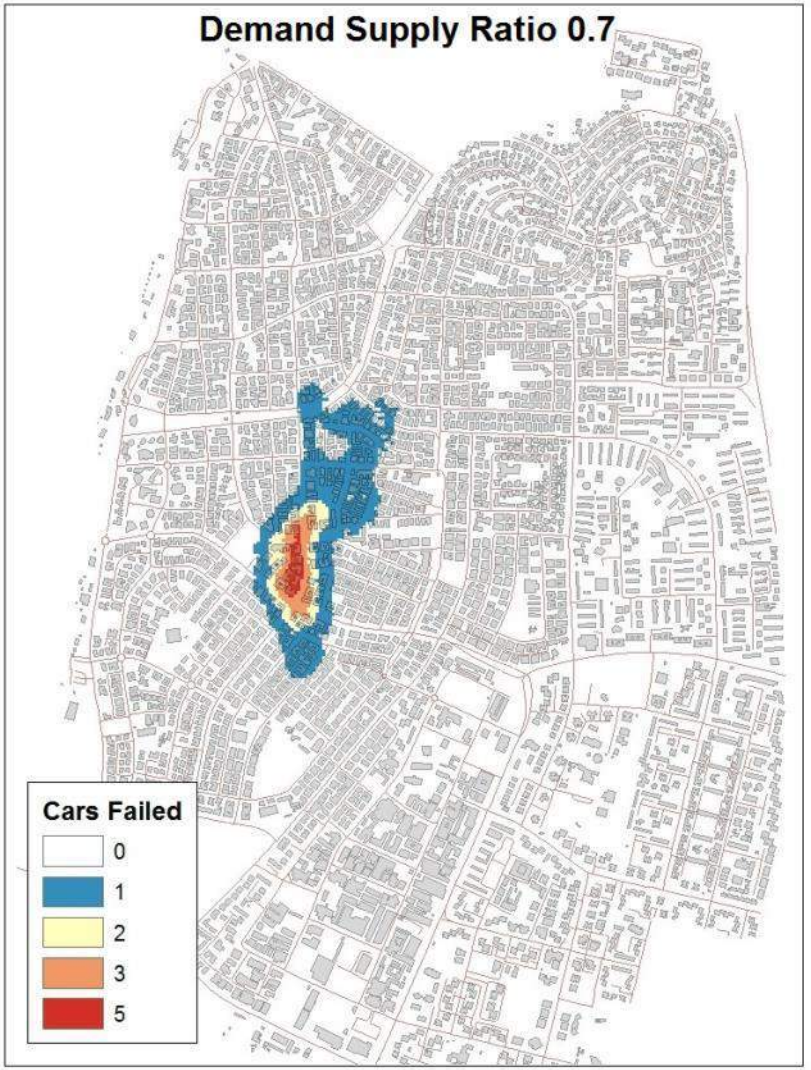
Towards SF-Park assessment: overnight parking



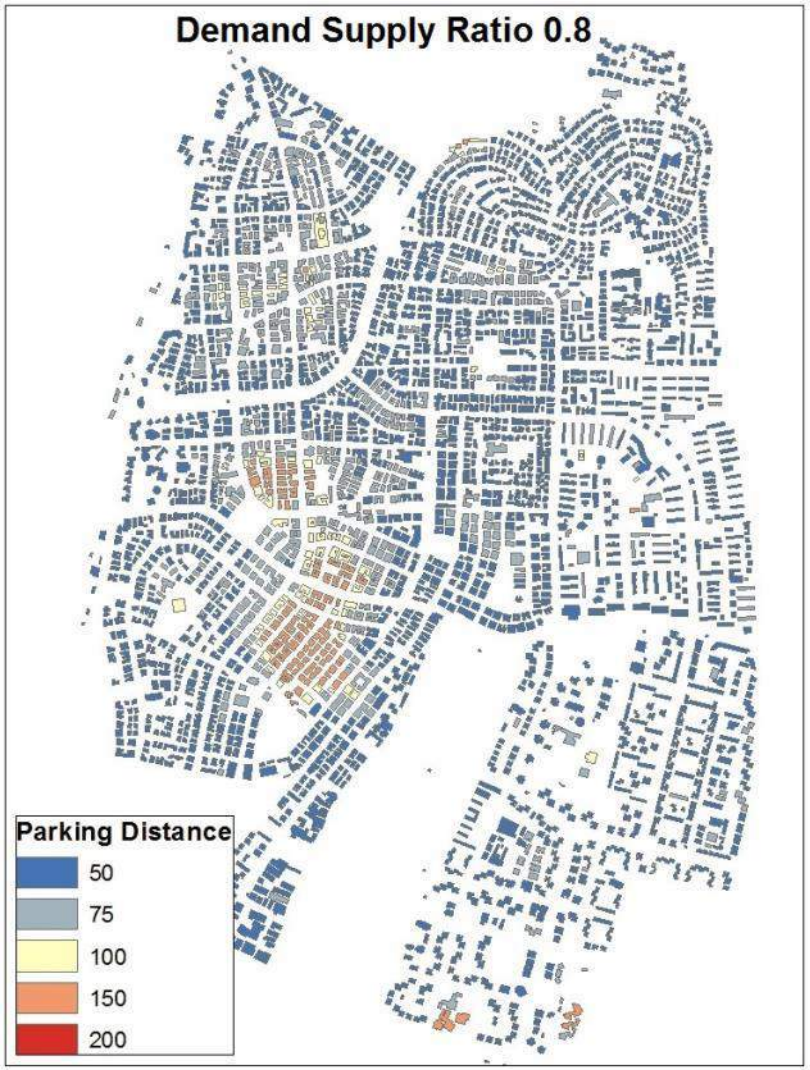


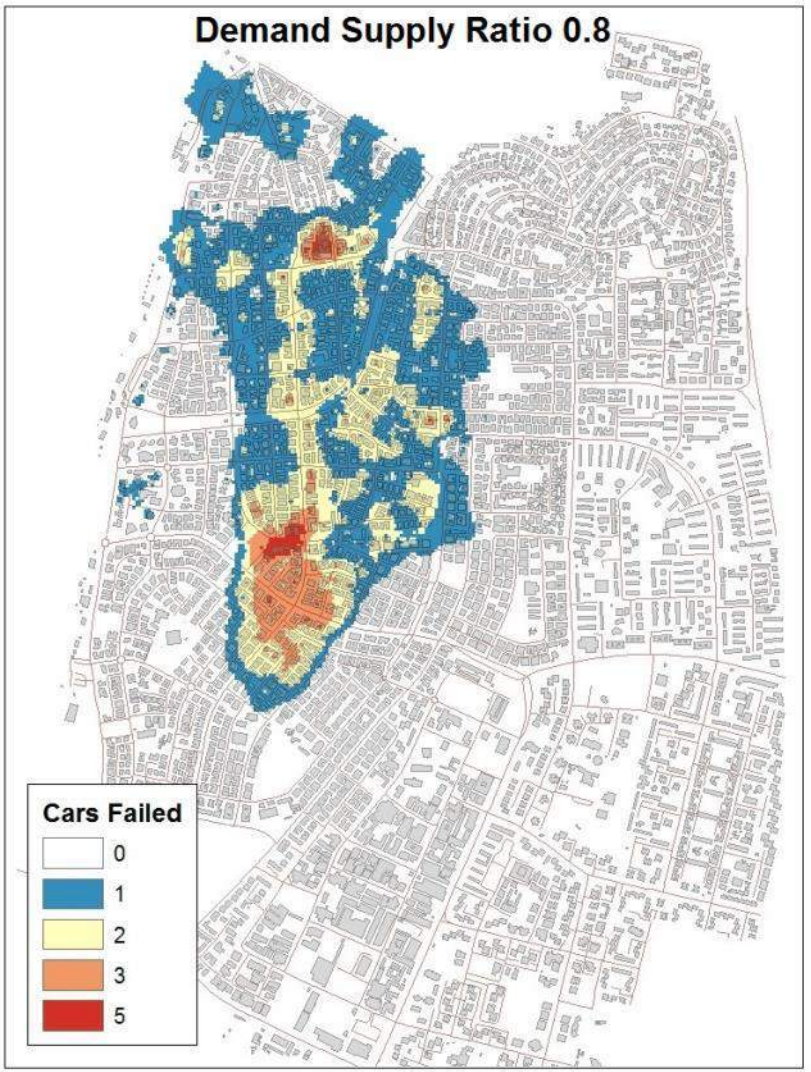
Towards SF-Park assessment: overnight parking



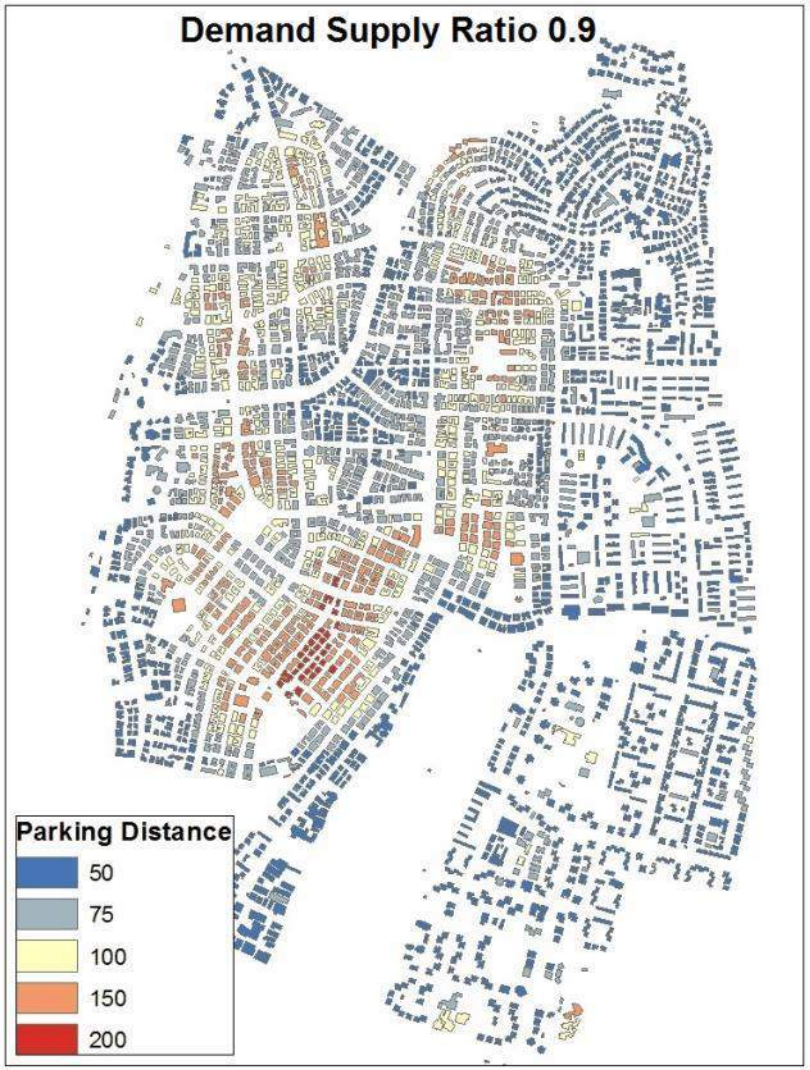


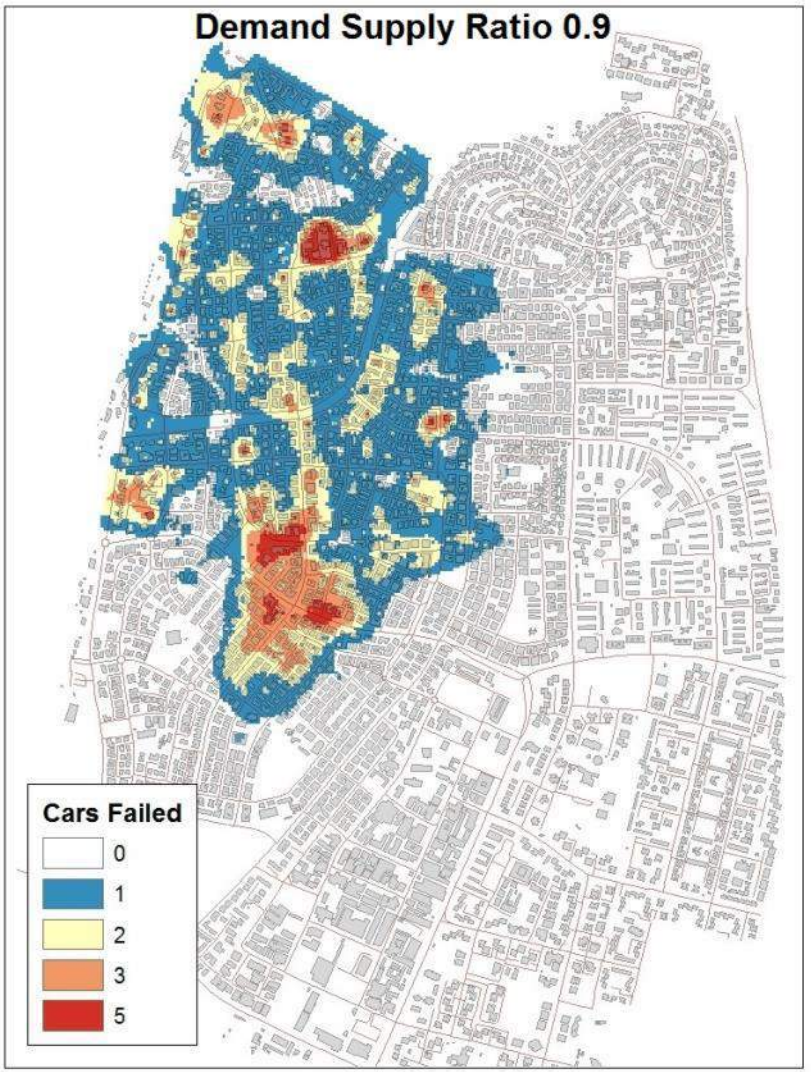
Towards SF-Park assessment: overnight parking



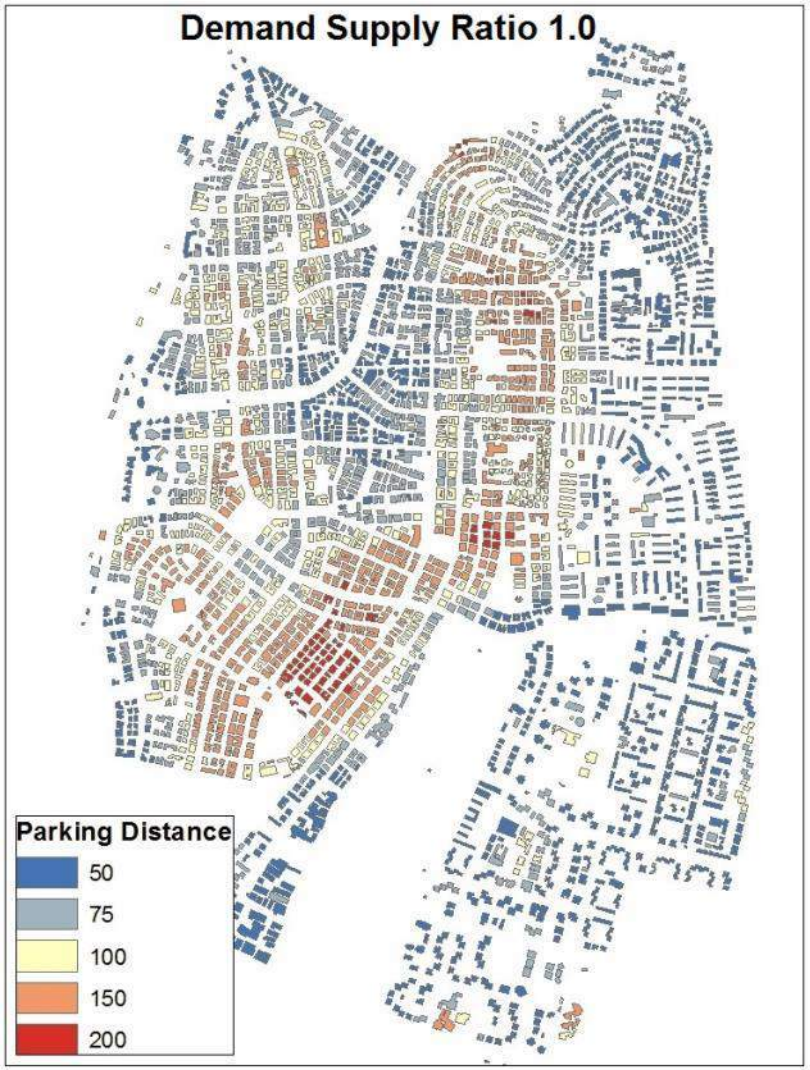


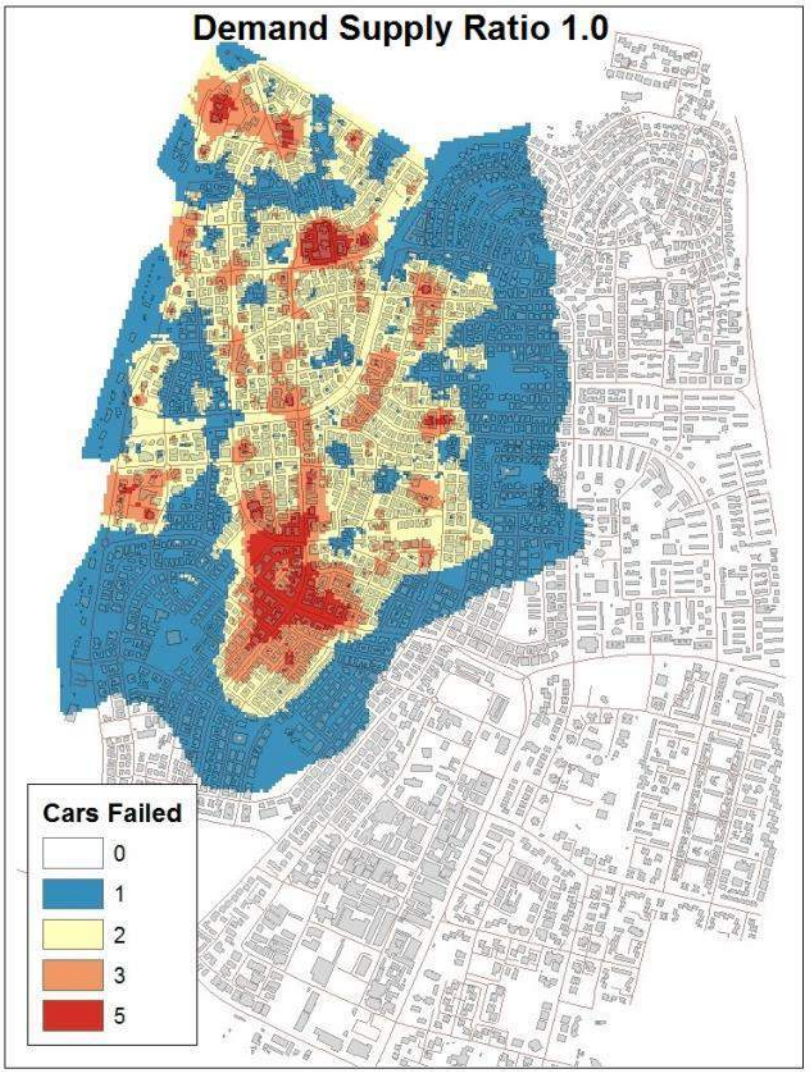
Towards SF-Park assessment: overnight parking



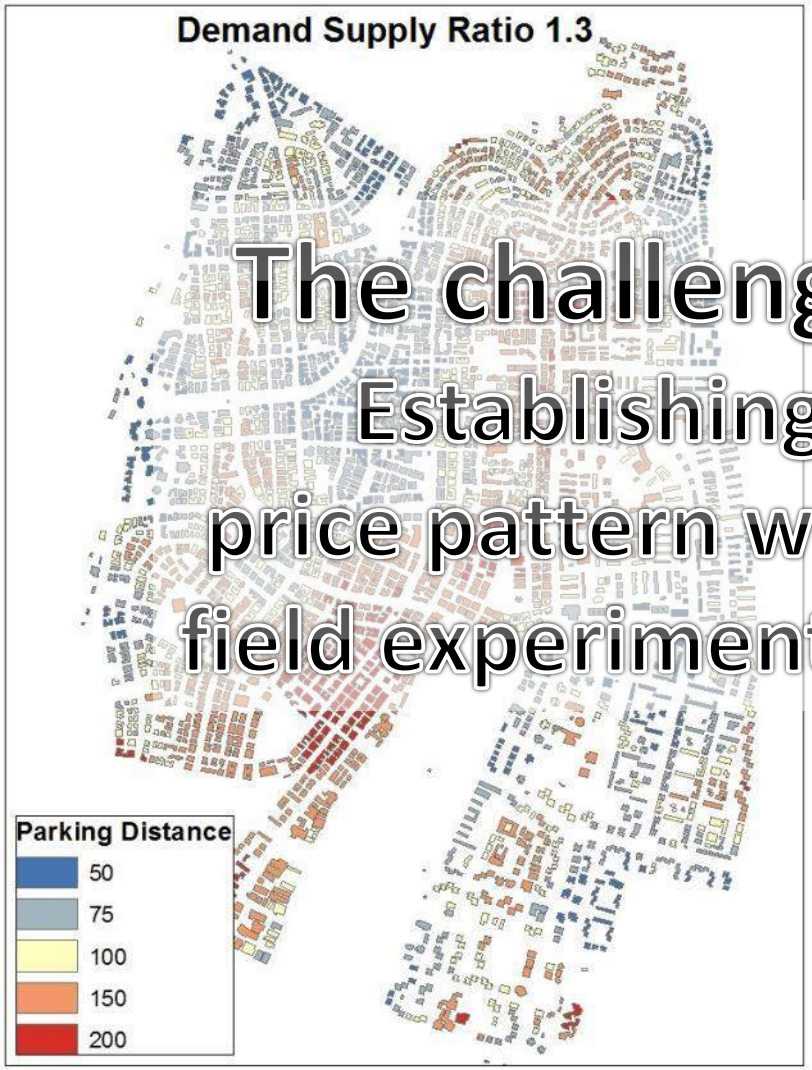


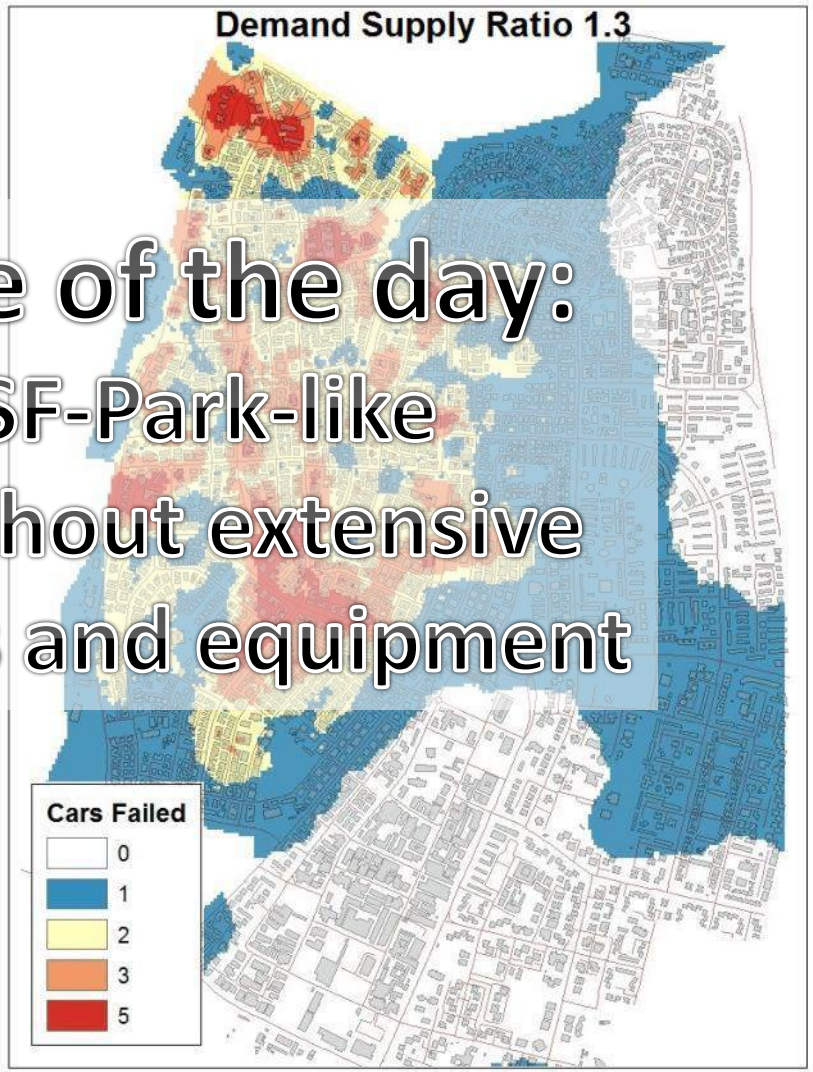
Towards SF-Park assessment: overnight parking





Towards SF-Park assessment: overnight parking





The challenge of the day:

Establishing SF-Park-like price pattern without extensive field experiments and equipment

HERE GOES ICT FUTURE OF PARKING

ICT: DEMAND *PATTERN*

ICT: SUPPLY *PATTERN*

MODEL: PRICES AND CONSTRAINTS *PATTERN*

ICT + MODELS: OPTIMAL PARKING SEARCH

ICT + MODEL: OPTIMAL PARKING CONTROL

Parking ICT – our expectations

Parking ICT enforces

- *Adaptive and spatially explicit prices and rules*
- *Supervised parking search*
- *Modeling as a tool for testing parking solution*

Parking ICT as a part of ITS evolves towards

- *Demand-responsive multimodal public transit*
- *Maximizes transport accessibility and effectiveness*

Anticipating the future…

Thank you!