

The ICT Future of Parking

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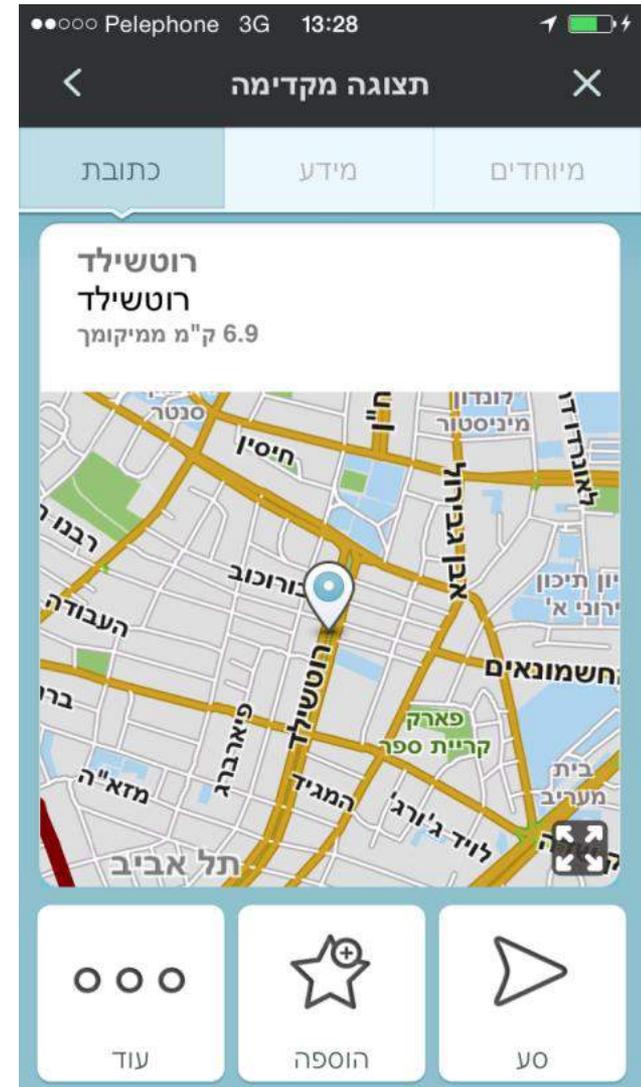
Transport ICT in action - CAR NAVIGATION SYSTEMS

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?

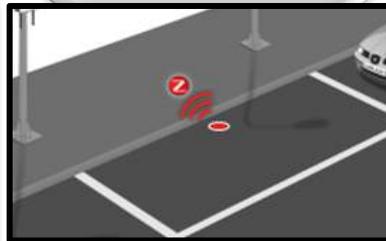
ICT in PARKING

Real-time
Signpost
Systems

Pay-by-cell

Sensors

Mobile
applications



The outline

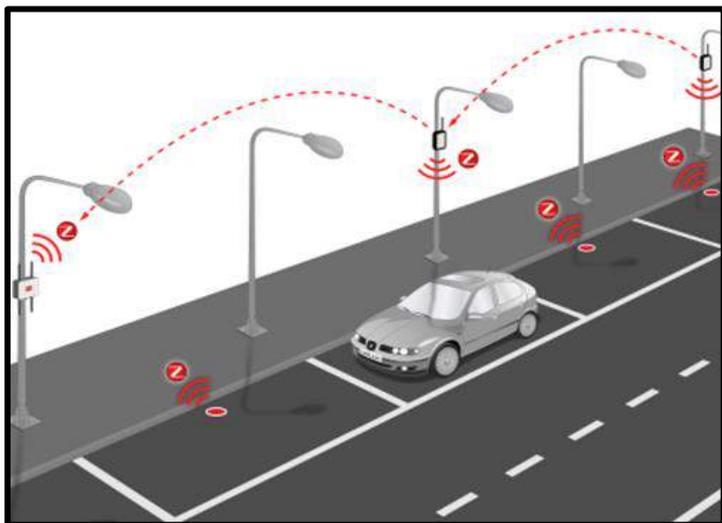
- *Best ICT-based practice: SFPARK*
- *From the hardware to software solutions: STATE-OF-THE-ART*
- *Testing ICT efficiency: AGENT-BASED MODELS*
- *Conclusions: OUR EXPECTATIONS FROM THE ICT*



Best Practice: San Francisco

Sensors → Adaptive parking prices

SFpark



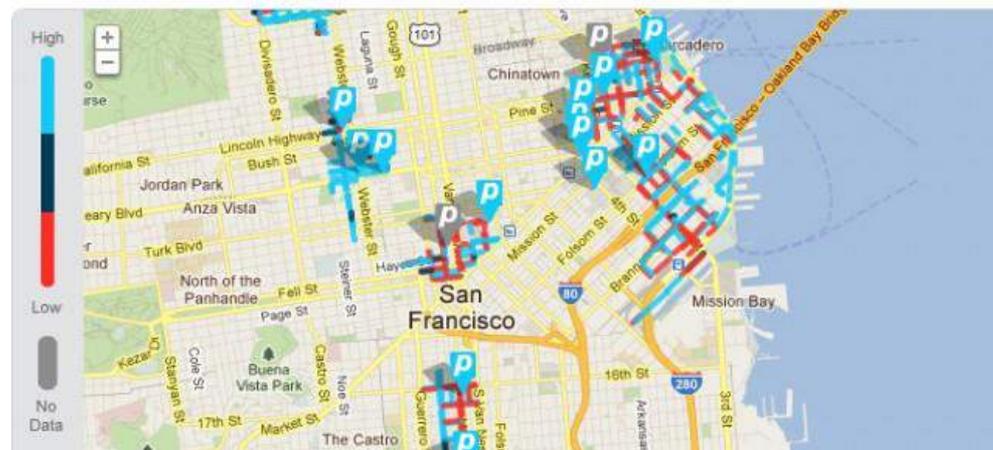
SFpark

[The Project](#)

[How it Works](#)

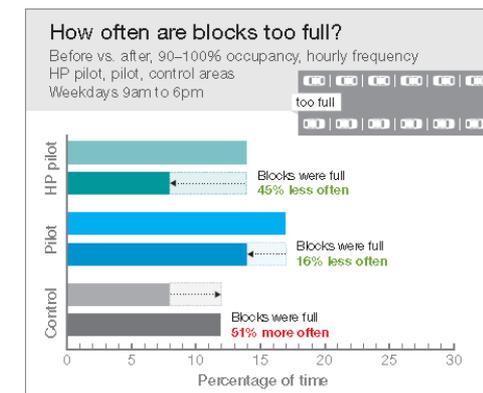
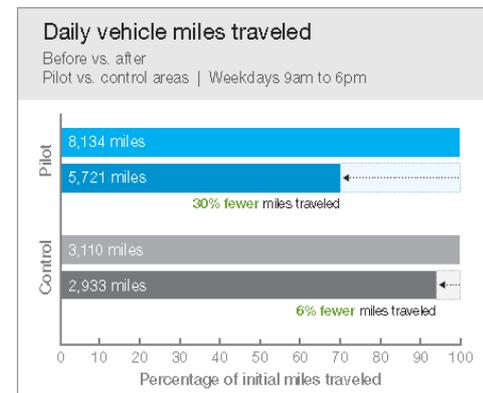
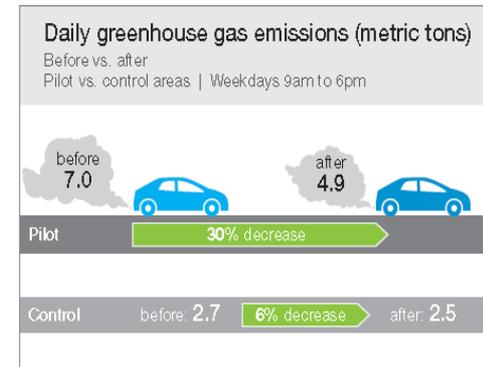
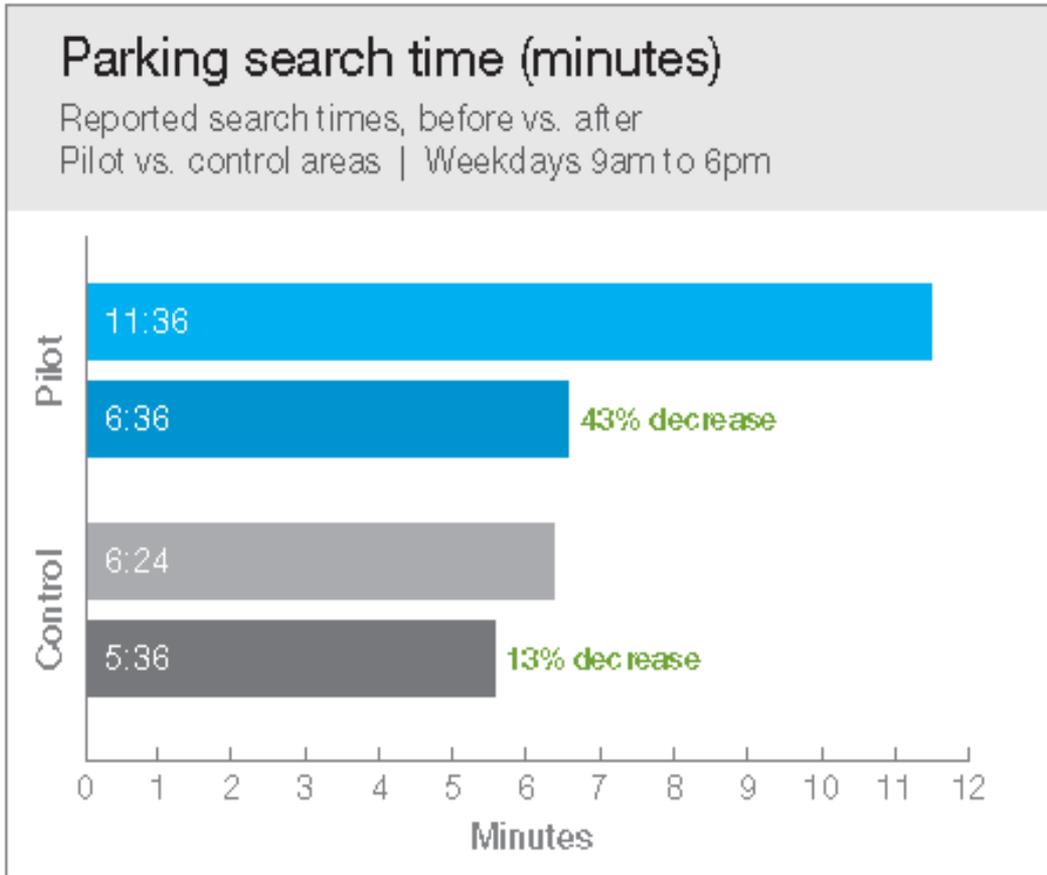
[FAQ](#)

[Resources](#)



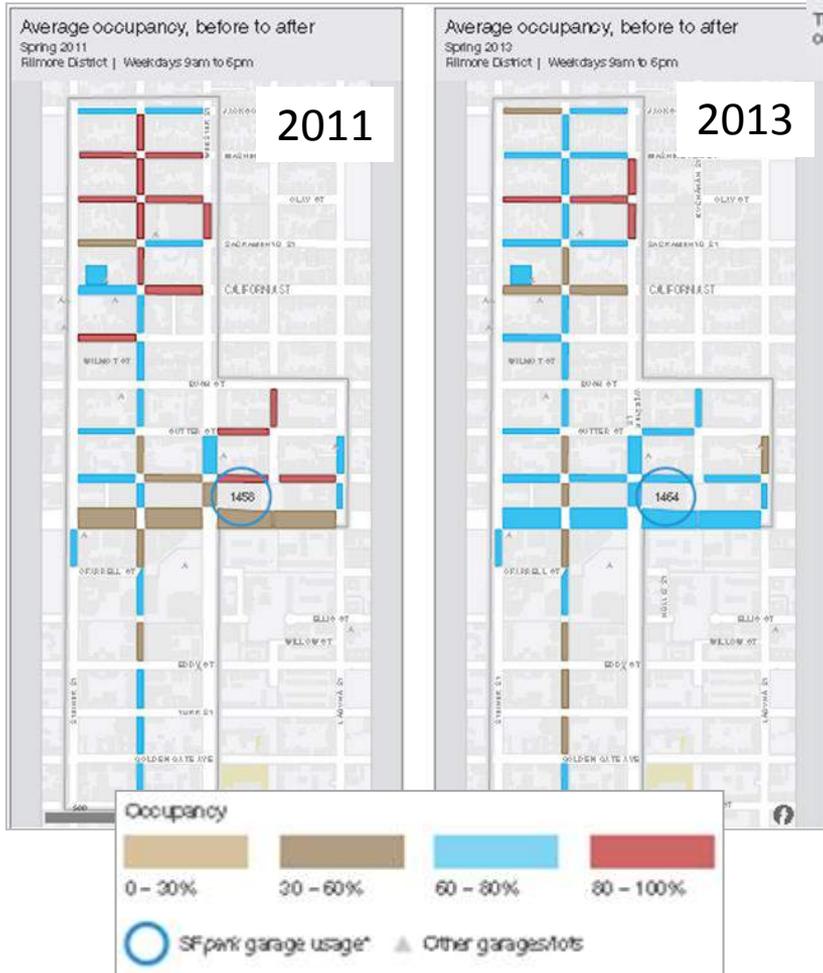
SF-Park really works!

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/

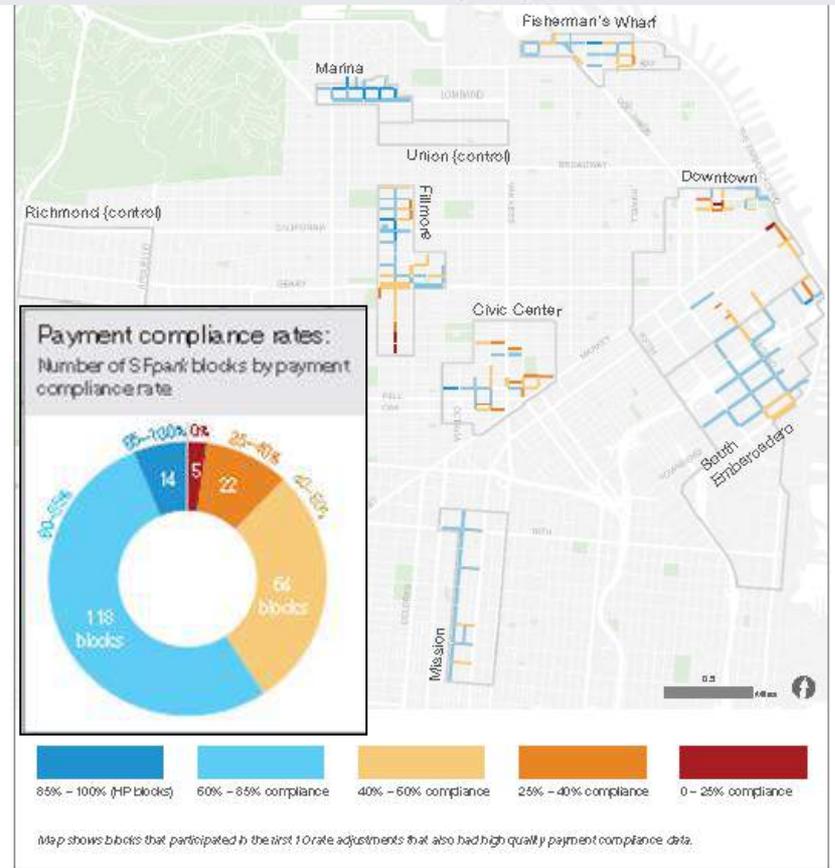
Parking is a heterogeneous phenomenon!



Occupancy
before and after

High payment compliance blocks

The 14 "HP" blocks are those with payment compliance rates over 85%. Calculated as paid time/occupied time. Average payment compliance rates calculated for 2011-2012. Other blocks shown for comparison purposes.



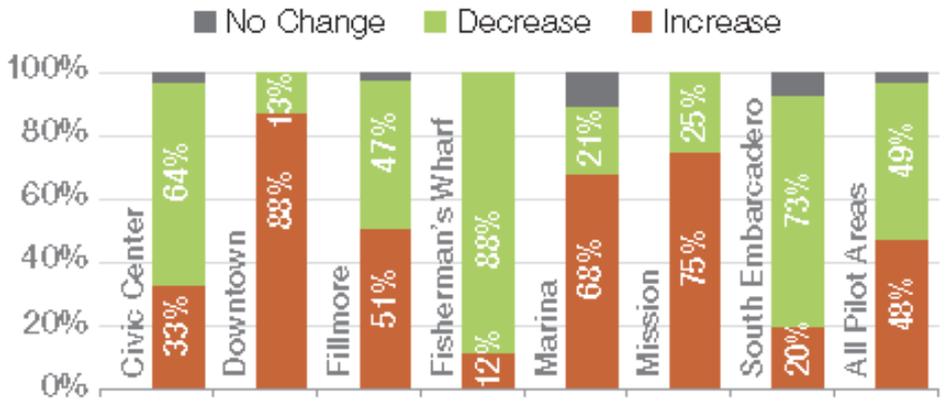
Readiness to pay is
heterogeneous too

To spread the demand uniformly we must react locally

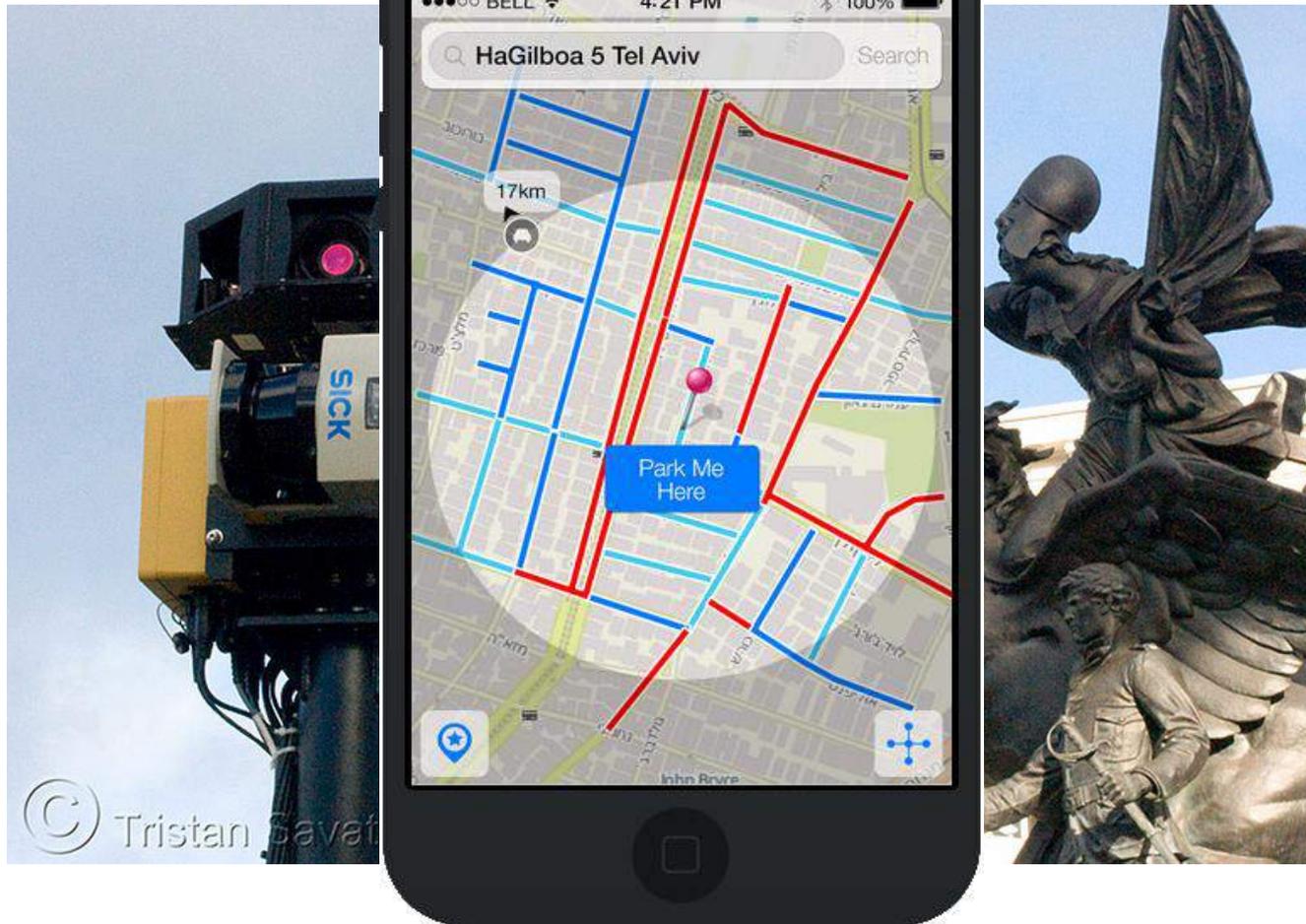
Pricing: net change
 Net change in average hourly rates at SFpark garages and blocks participating in rate adjustments
 Weekdays, 9am to 6pm | Before vs after

Percent of blocks with:
 increase, decrease, or no change in rates

Blocks that participated in the first 10 SFpark rate adjustments
 Based on changes to average weekday hourly rates
 Before vs after (i.e., "before" rates compared with rates
 after 10 rate adjustments)



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



© Tristan Savat

Reuse of privately owned parking: ParkatmyHouse.com

Smarter parking
ParkatmyHouse

Where do you need to park? or

From Until

Very limited supply

in cooperation with **BMW i.**

Rent a private parking spot

- Save money**
Renting a private garage, driveway or car park space can save you up to 70% on your parking costs.
- Safe & secure**
Thanks to our feedback and review system, you can have peace of mind when booking.
- Community**
ParkatmyHouse is the largest online parking community. We'd love you to be part of it.
- Quick & easy**
You can search, book and pay for a parking space in under 5 minutes.

MONEY MADE
£5,172,349

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theguardian Daily Mail BBC NEWS FT The Daily Telegraph itv

Community-based exchange of parking information: PARKO.com

The image shows a screenshot of the Parko.com website. At the top right, there are links for 'HOME | HOW IT WORKS | FAQ | PRESS | CONTACT' and language options 'עברית | English'. The main logo 'Parko' is prominently displayed in a stylized font. Below the logo, there is a navigation menu with a car icon and the text 'for parking? that finds par...'. A yellow text box is overlaid on the page, containing the following text: 'Does not work:', 'Low turnover – friends do not come', and 'High turnover – strangers came first'. At the bottom of the page, there are two buttons: 'Available on the App Store' and 'GET IT ON Google play'. The background of the website is blue with faint car icons.

HOME | HOW IT WORKS | FAQ | PRESS | CONTACT

עברית | English

Parko

for parking?
that finds par...

that are about to become available & navigates you to one.

Available on the App Store

GET IT ON Google play

Does not work:
Low turnover – friends do not come
High turnover – strangers came first

Parking lots prices and availability

BestParking.com

The screenshot displays the BestParking.com website interface. At the top, there is a navigation bar with links for Home, About Us, Developers, Parking Operators, Terms of Service, and Contact Us. Below this is a banner for BestParking.com with icons for mobile devices (iPhone & iPad, Android, Mobile Site, BlackBerry 10) and social media (Facebook, Twitter, Plus). The main heading reads "NYC Parking - Find. Compare. Save." followed by "Parking Garage Coupons & On-Street Regulations". A yellow text overlay in the center states "Useful, but ignores on-street parking". The bottom portion of the image shows a map of Manhattan with various parking spots marked with price tags (e.g., \$25, \$35, \$40, \$44, \$47, \$50, \$55, \$59, \$76). On the left side of the map, there are filters for "Garage/Lot Legend" (Rates Updated Quarterly, Rates Guaranteed w/ Coupon, Reservation Enabled) and "On-Street Legend" (Free, Metered*, Prohibited*). The map also shows arrival and departure times (Jun 24, 4:30 PM to 7:30 PM).

Optimal Parking search: PARKNAV

parknav HOME TRY IT FREE PRICING ABOUT CONTACT

Take Parknav for a spin right from your couch to know what parking is like at your destination.
Enter an address first and then you'll see a multicolored path which indicates the likelihood of available street parking.
Simply drive along this path with your car and voila, "You have reached your destination".

madison 4 Chicago Find Parking

+ ADVANCED SEARCH

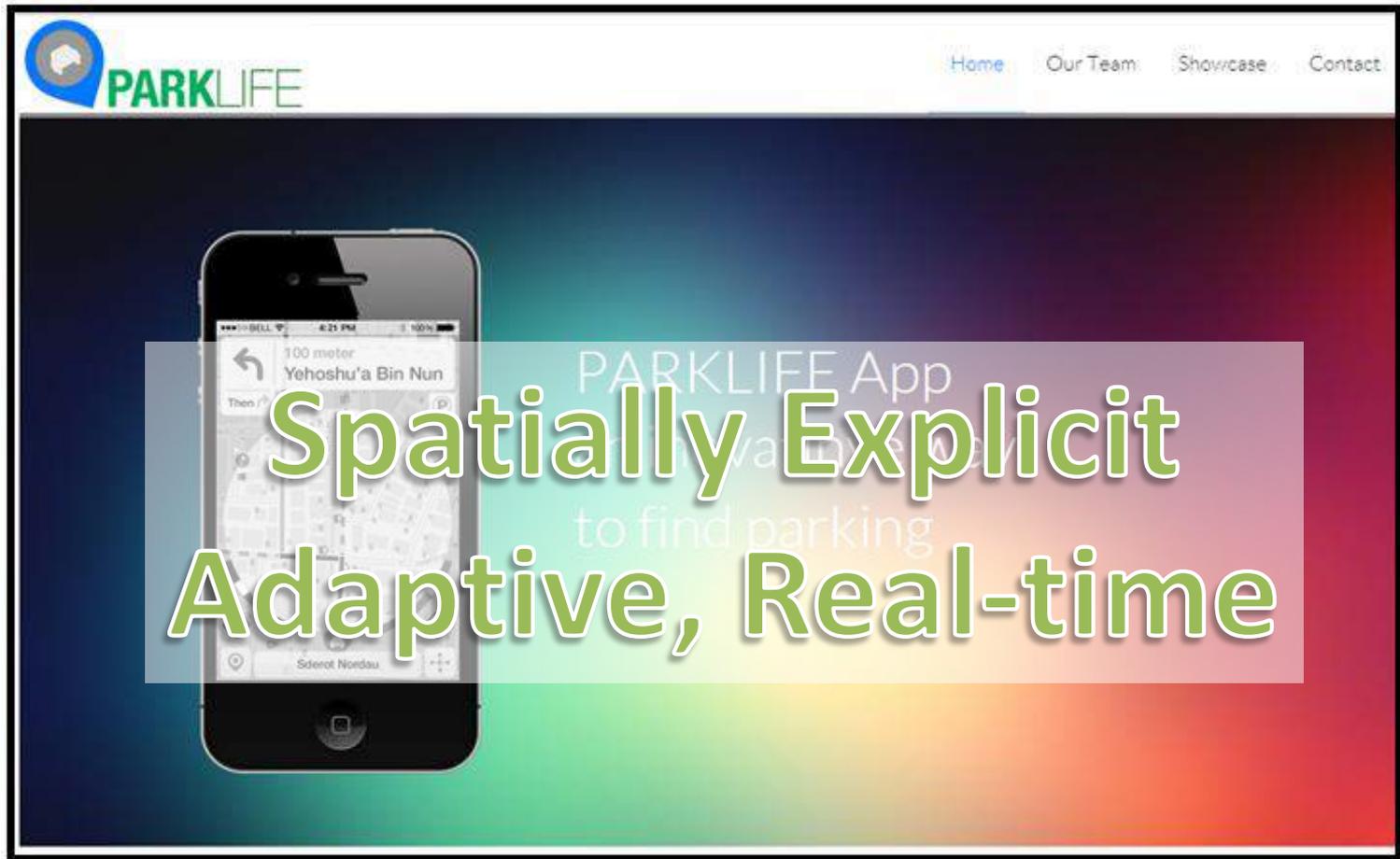
**Spatially Explicit,
not Real-Time**

Parking Chance

Low	0-25%	High	50-75%
Med	25-50%	Highest	75-100%

Map data ©2014 Google Terms of Use Report a map error

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...

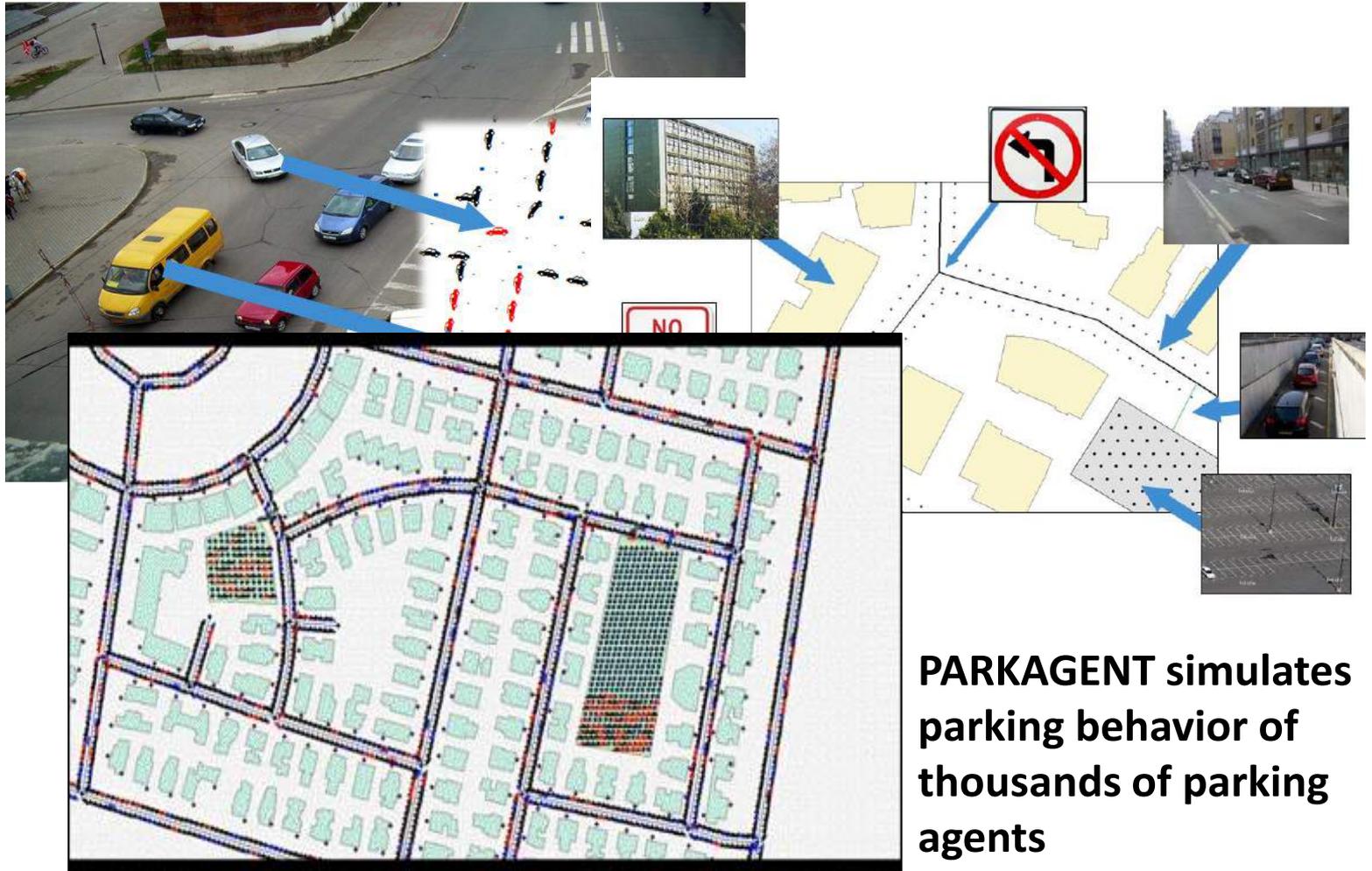
Can we test them before implementation?

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

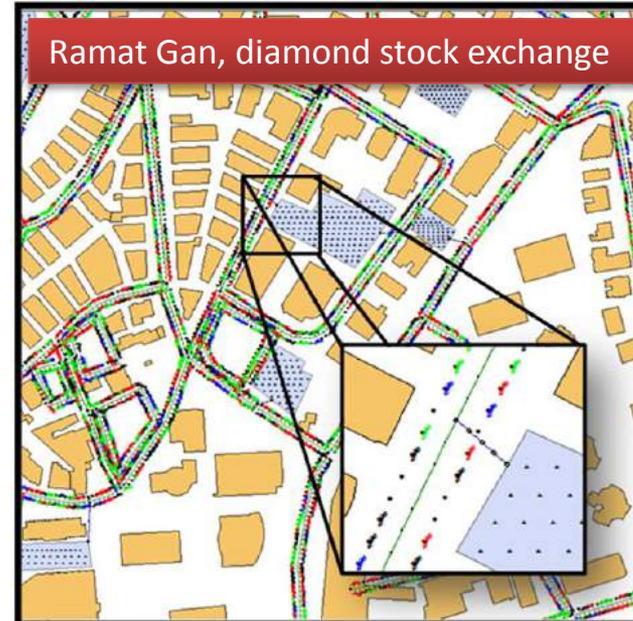
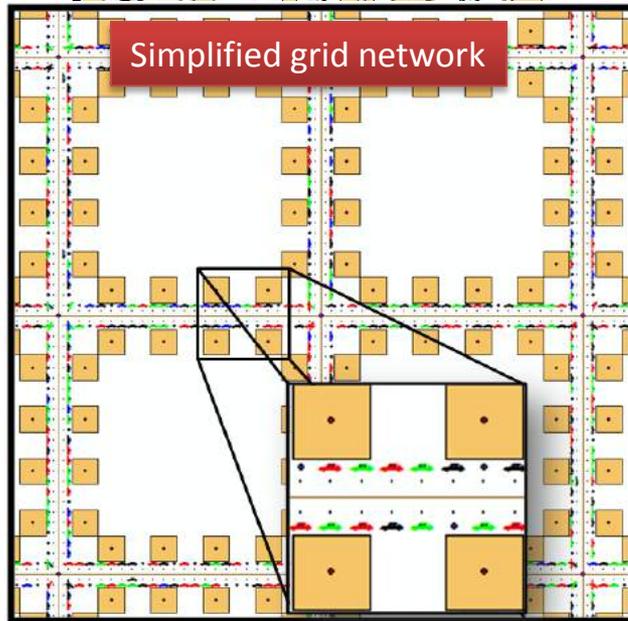
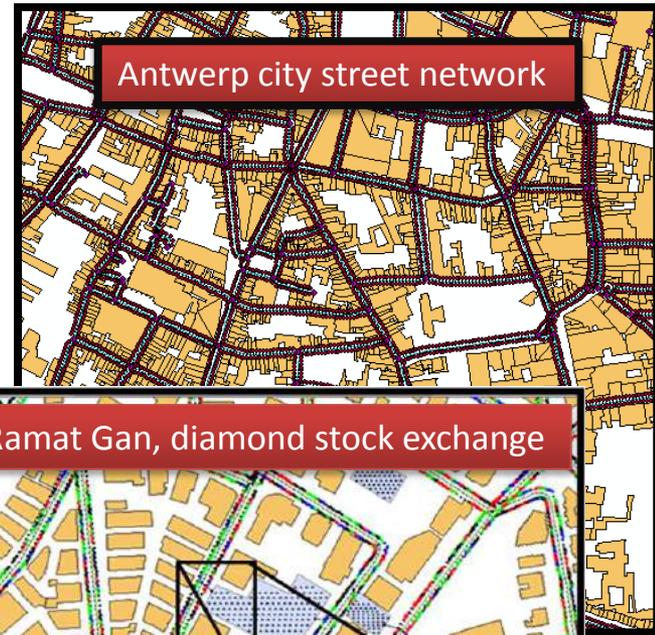
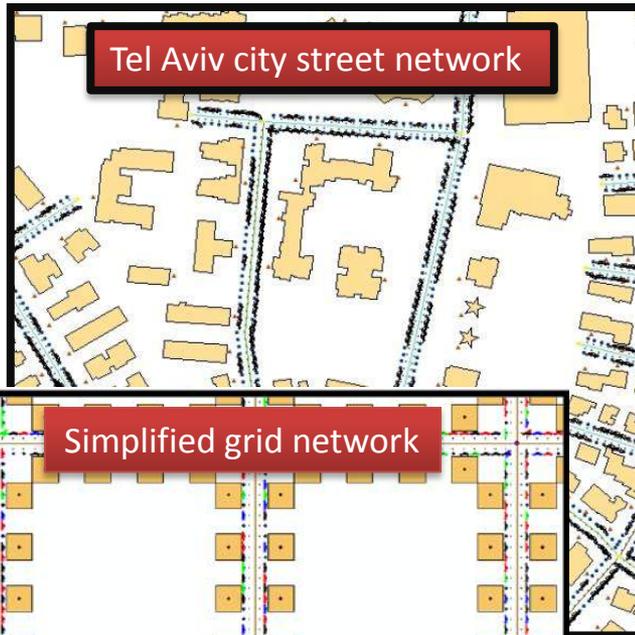


Our solution: PARKAGENT, an Agent-Based Model of Parking Search

-  Residents
-  Commuters
-  Guests
-  Customers



PARKAGENT is easily adjustable



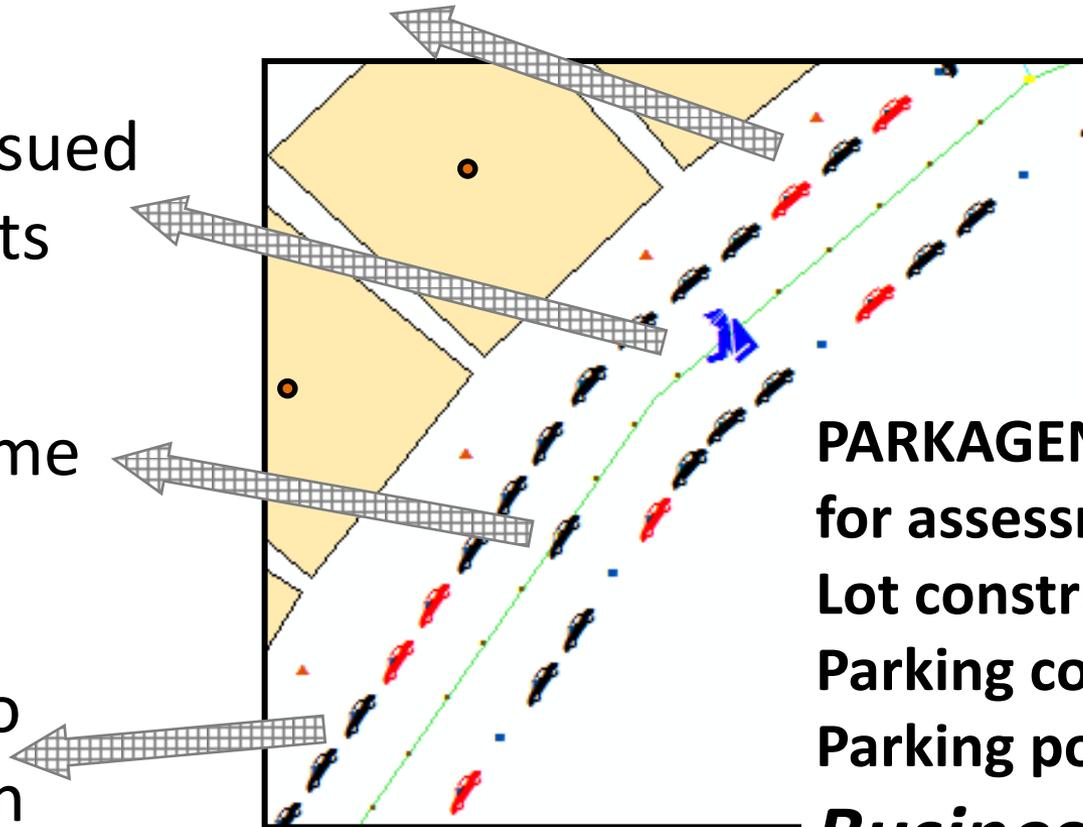
PARKAGENT imitates ICT tools and supplies all policy-important outputs:

Occupancy rate per street

No of issued tickets

Cruising time

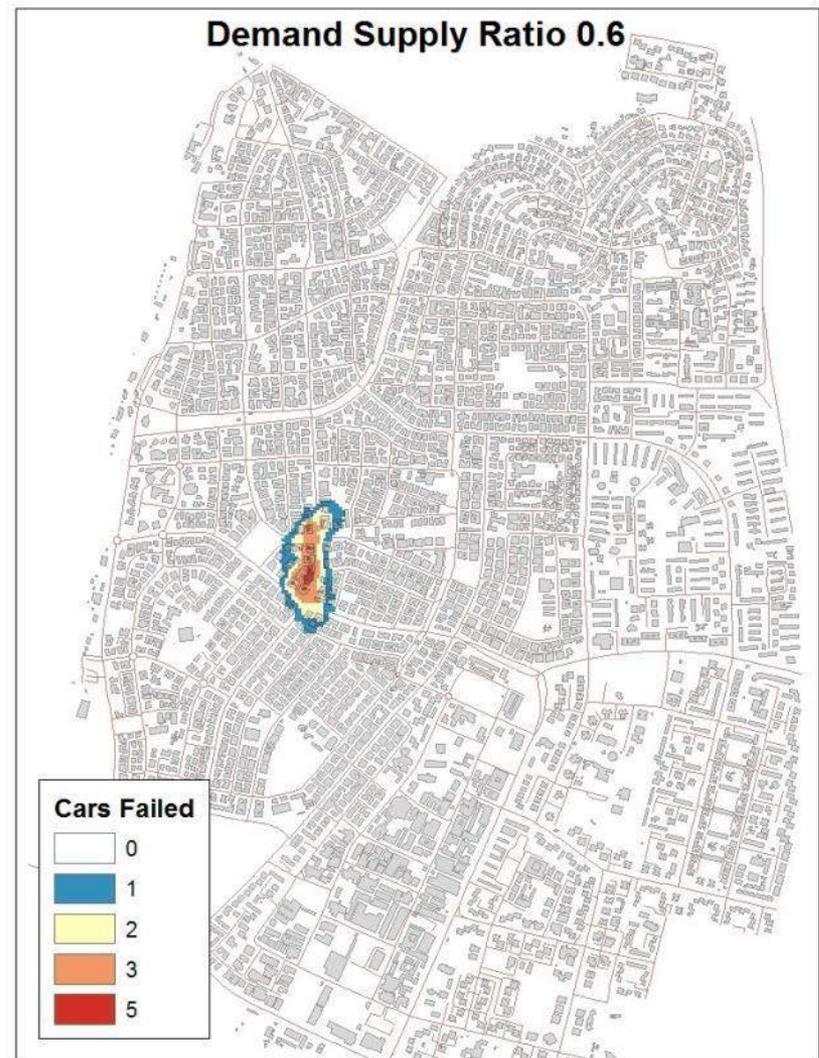
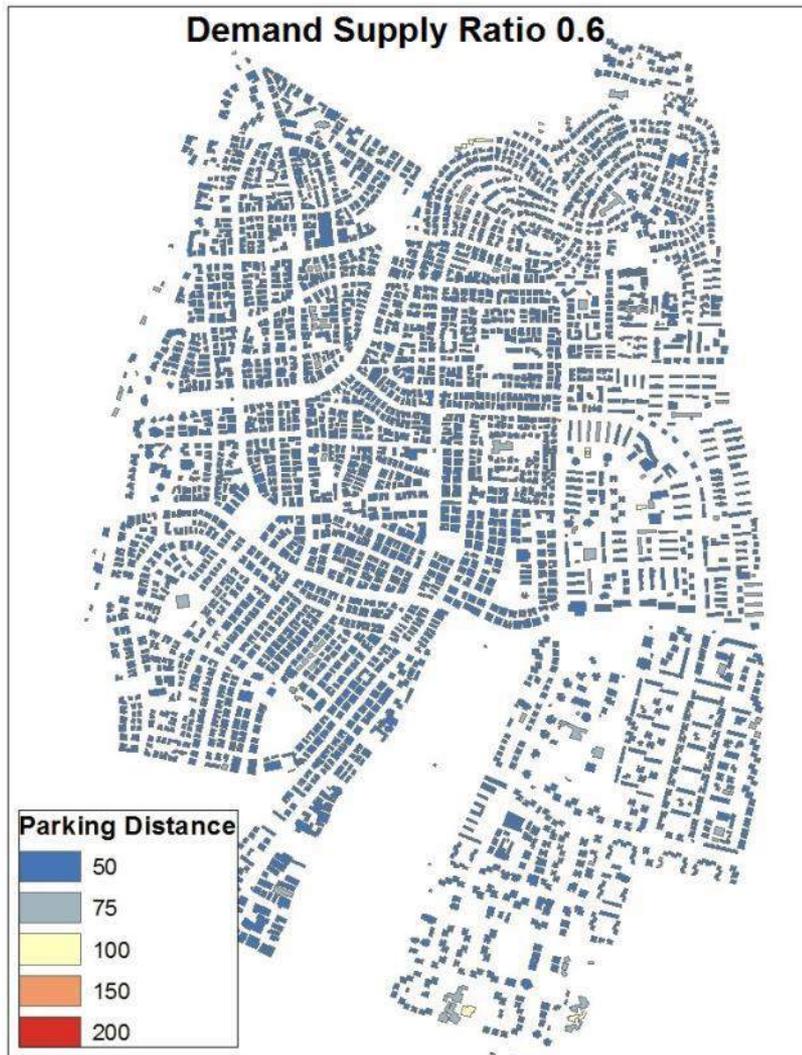
Distance to Destination



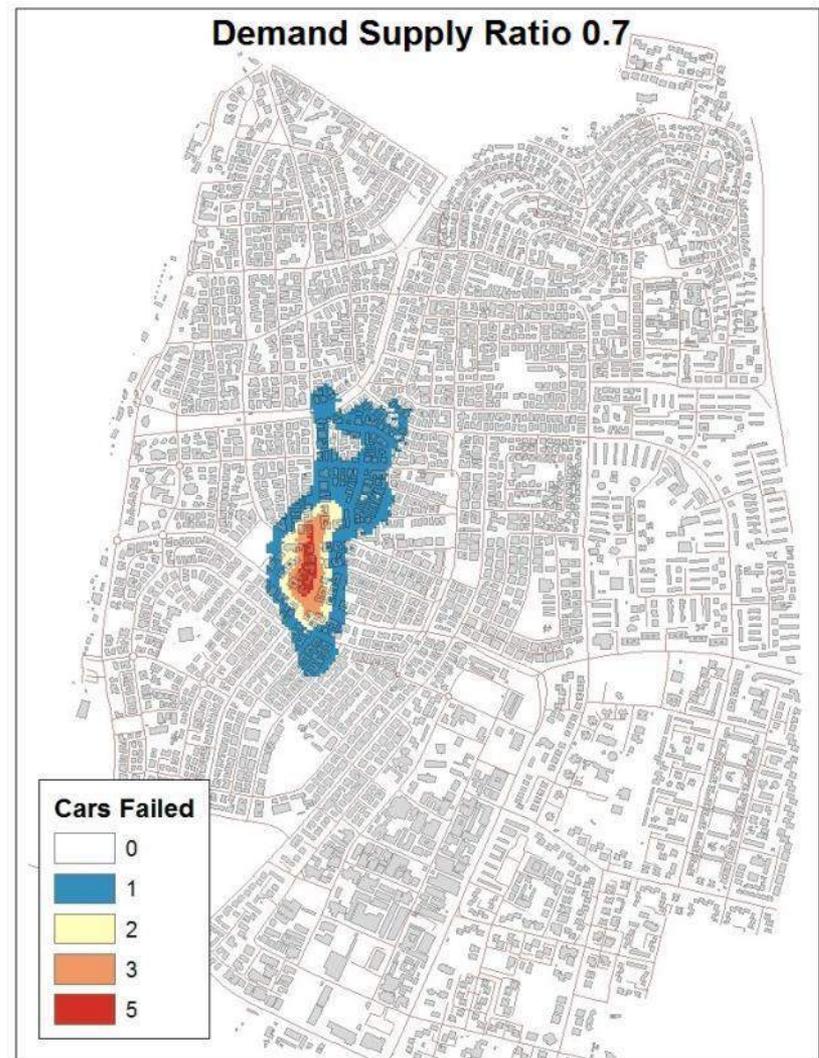
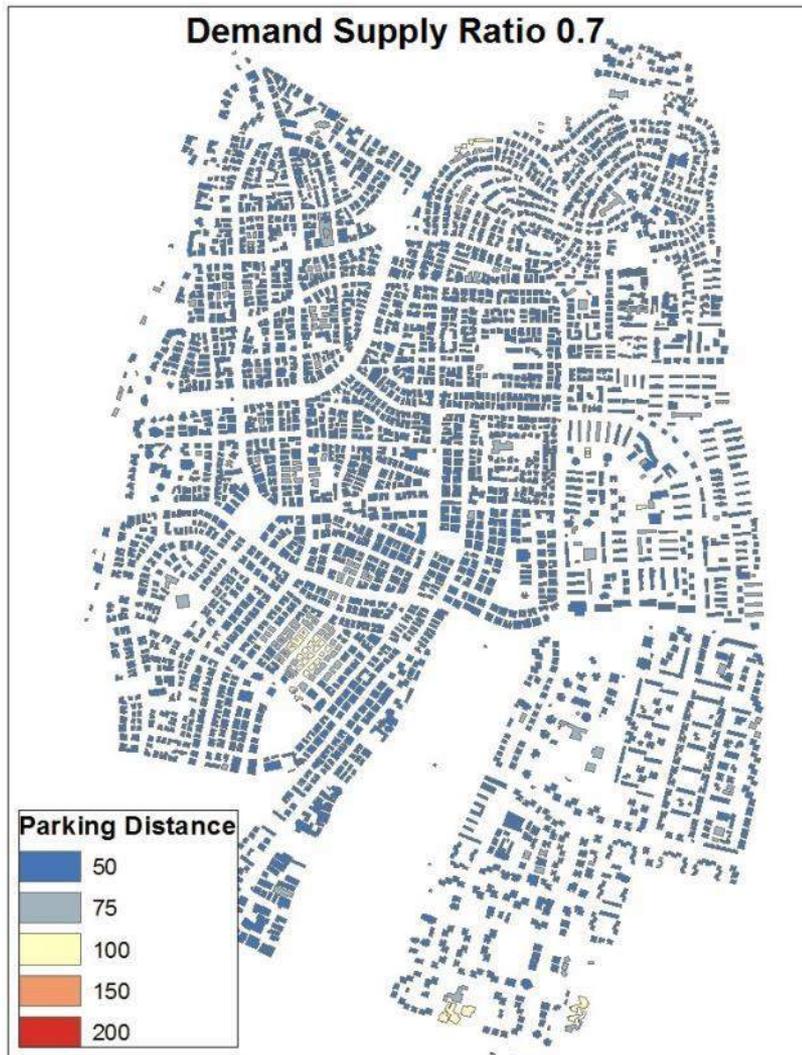
PARKAGENT was used for assessment of:
Lot construction projects,
Parking control,
Parking policy,
Business models

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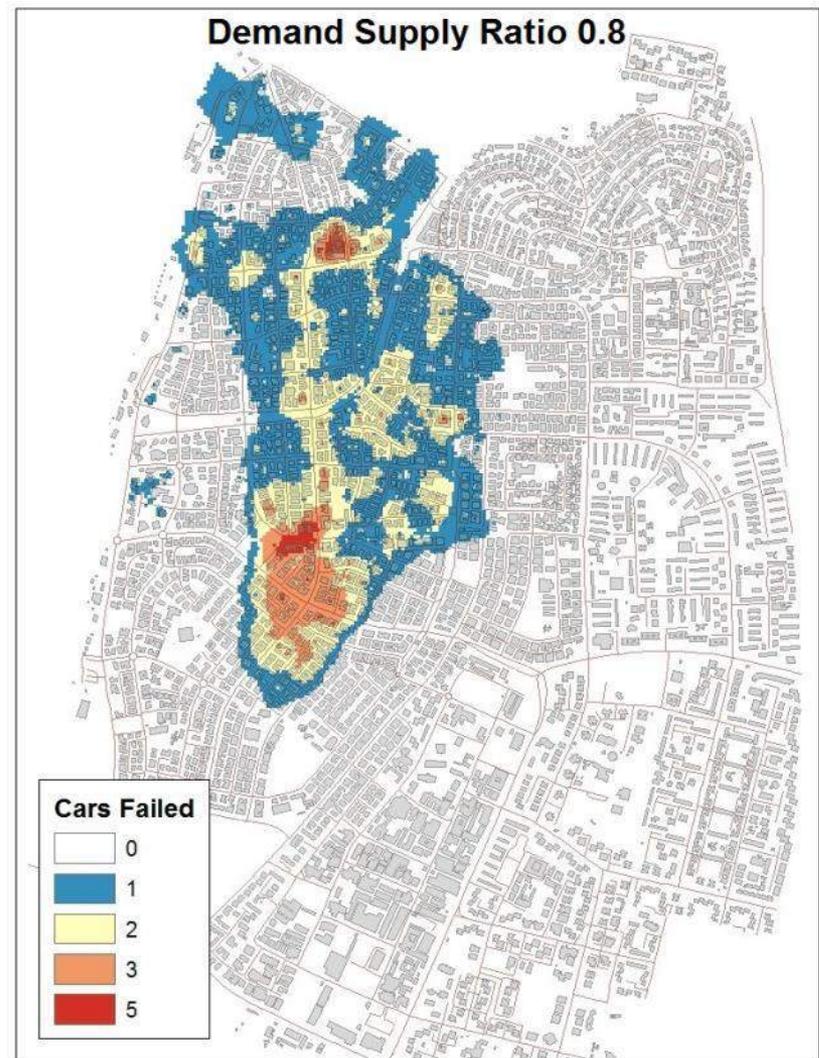
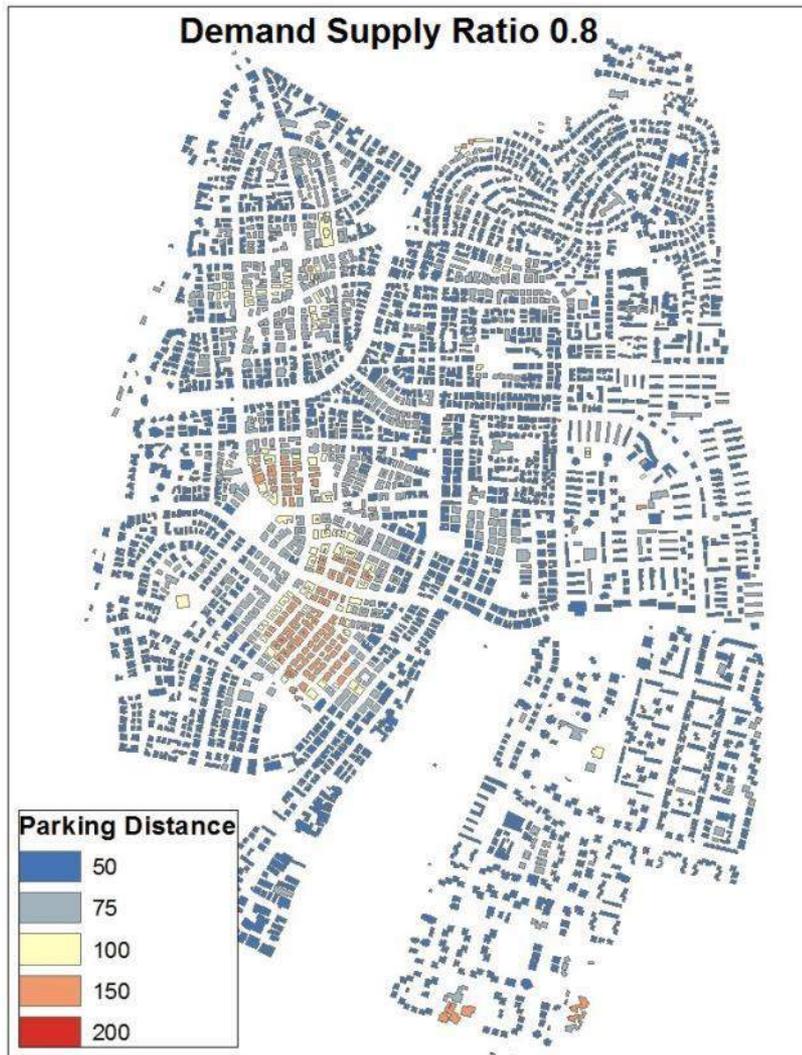
Towards SF-Park assessment: overnight parking



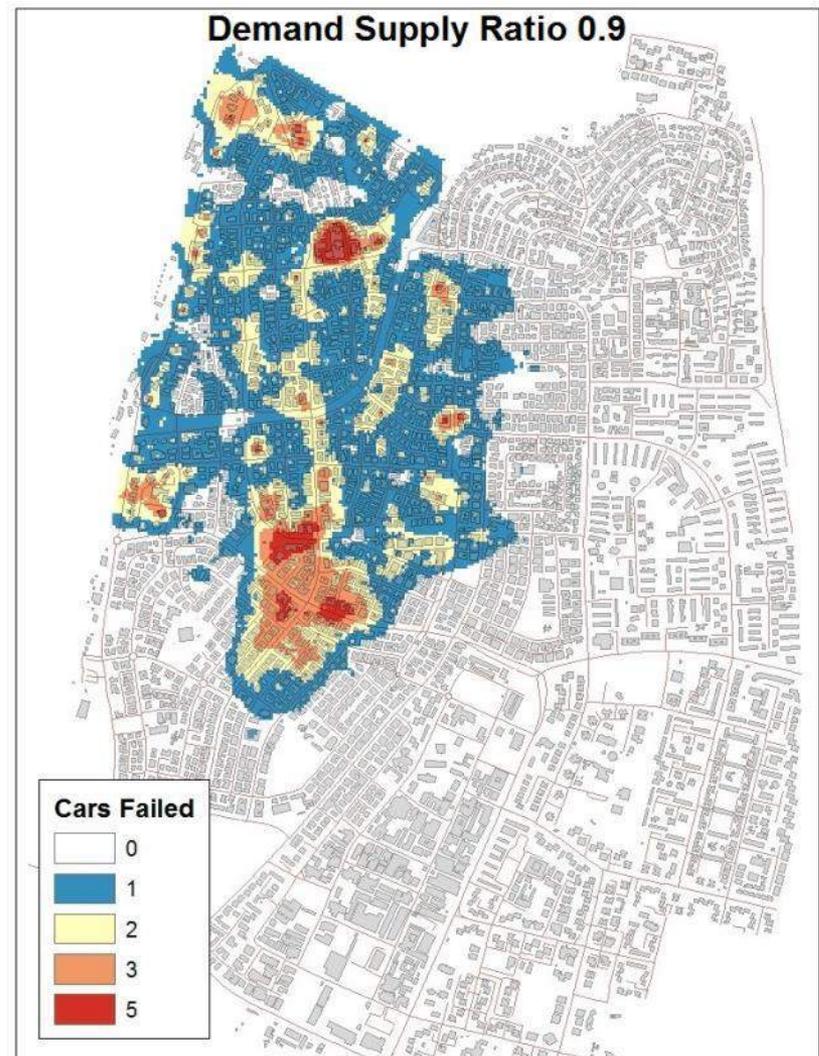
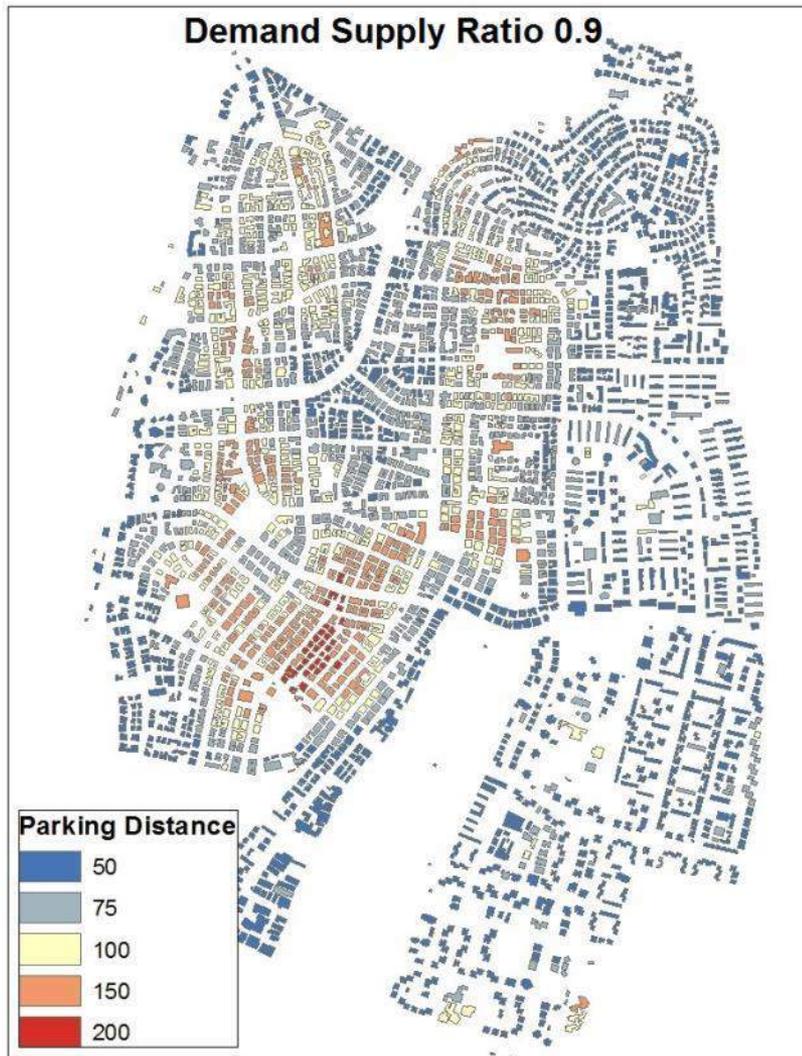
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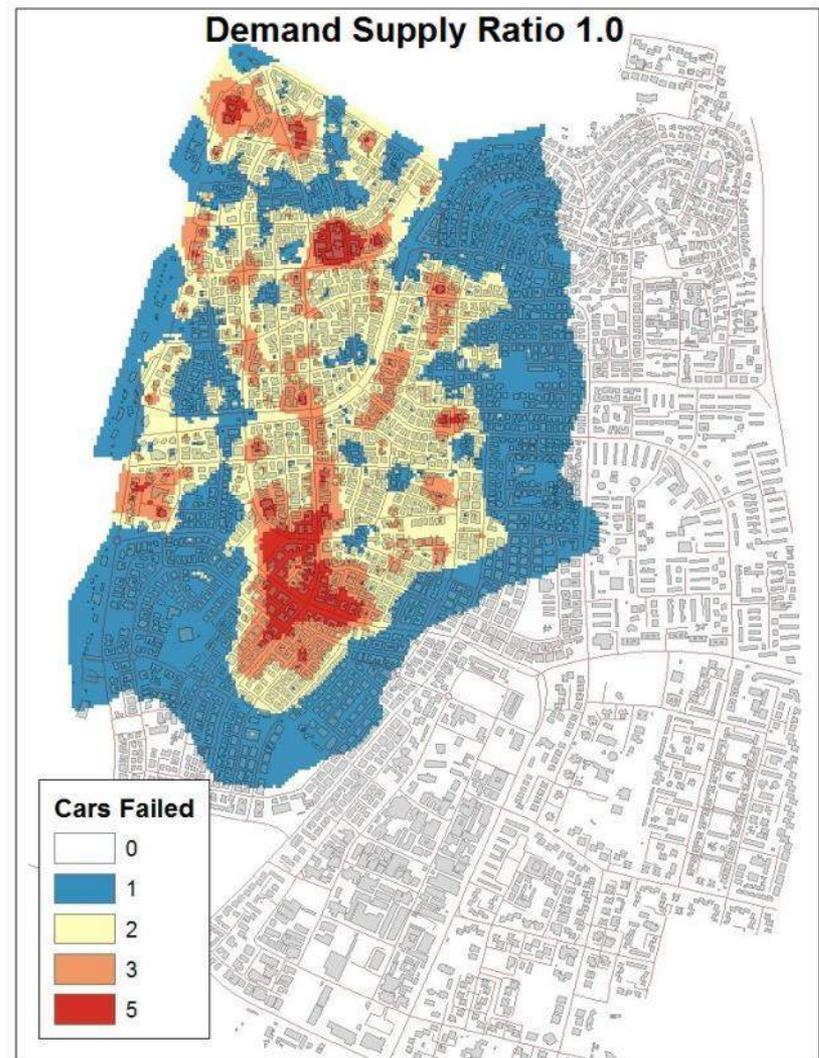
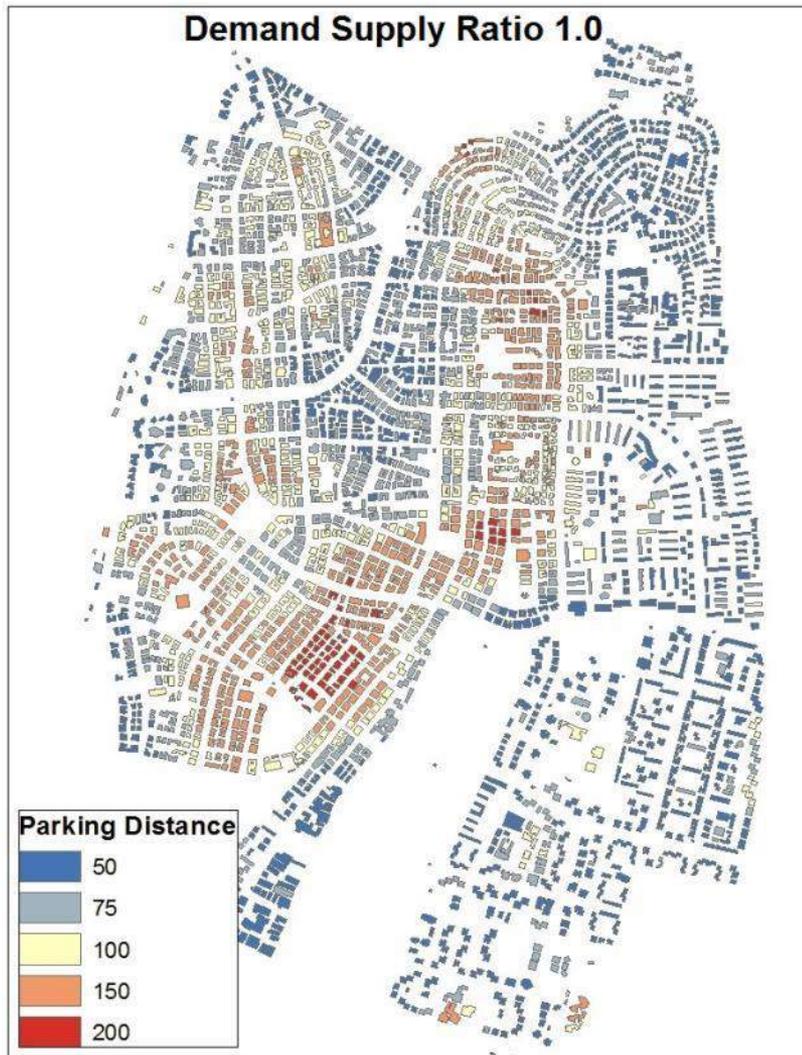
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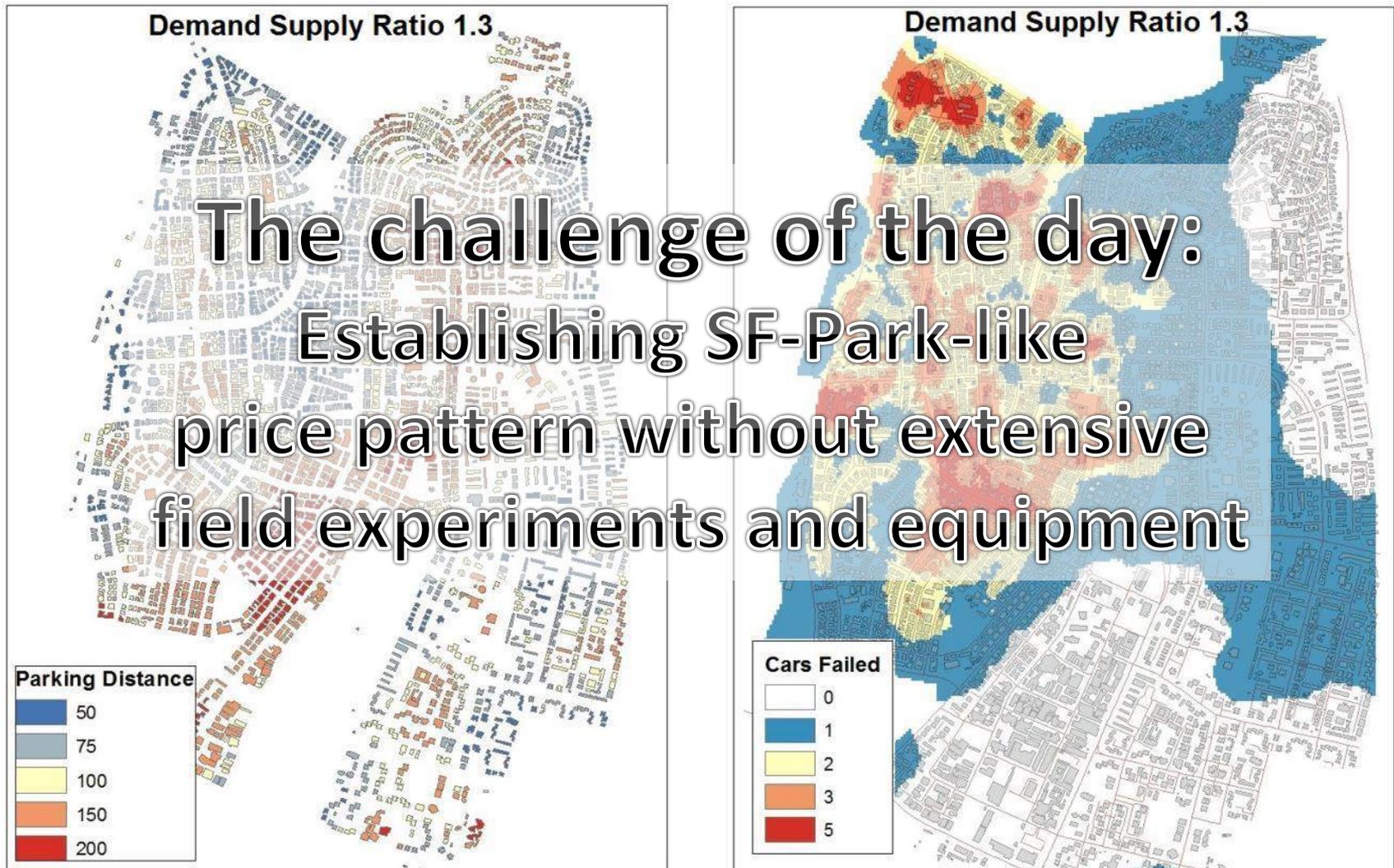
Towards SF-Park assessment: overnight parking



Towards SF-Park assessment: overnight parking



Towards SF-Park assessment: overnight parking



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!