

The ICT Future of Parking

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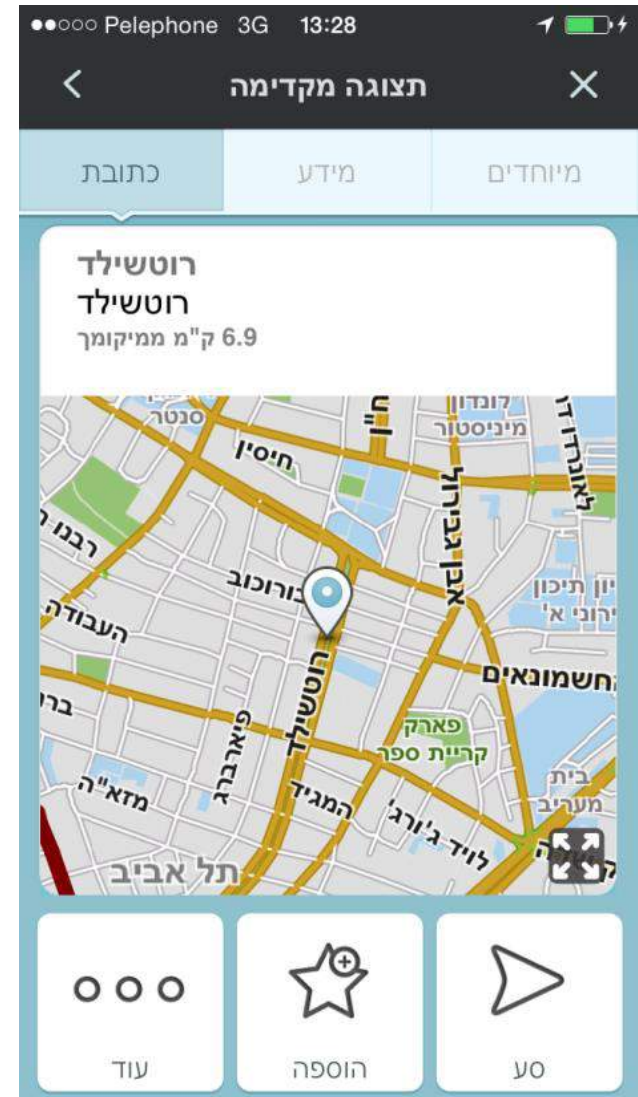
Transport ICT in action - CAR NAVIGATION SYSTEMS

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?

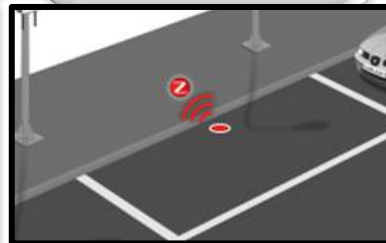
ICT in PARKING

Real-time
Signpost
Systems

Pay-by-cell

Sensors

Mobile
applications



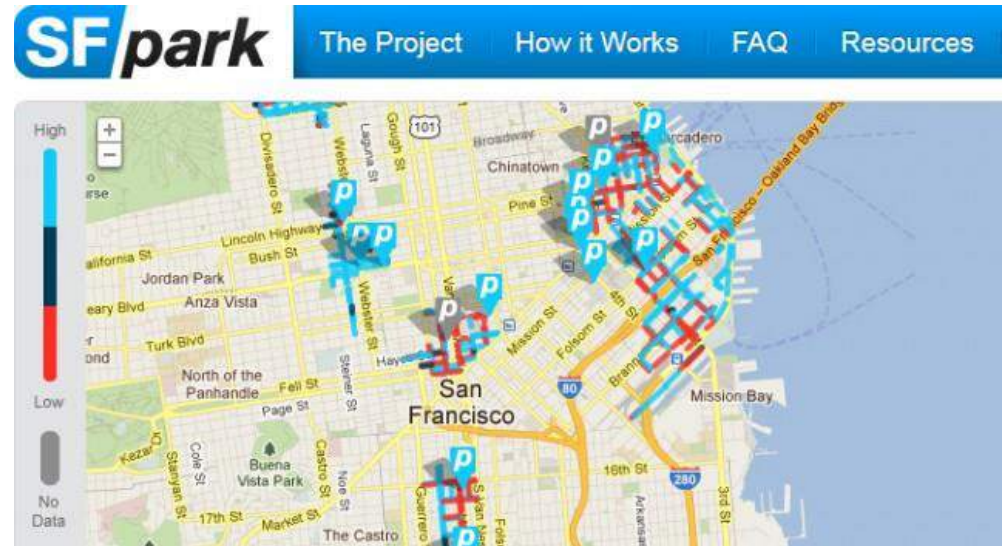
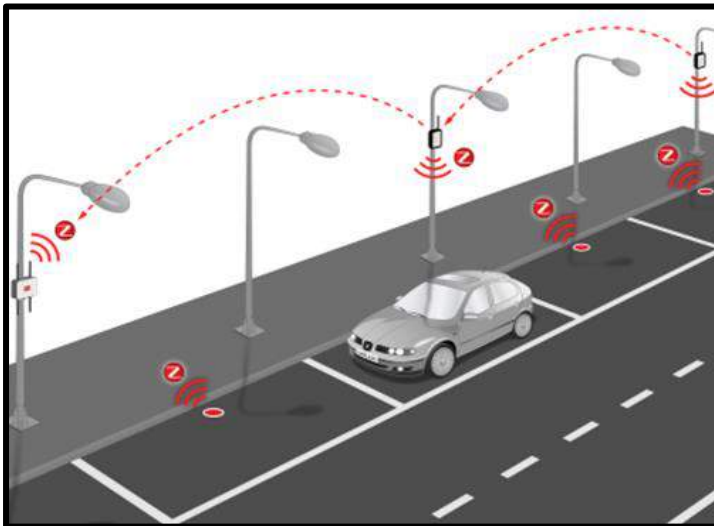
The outline

- *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*



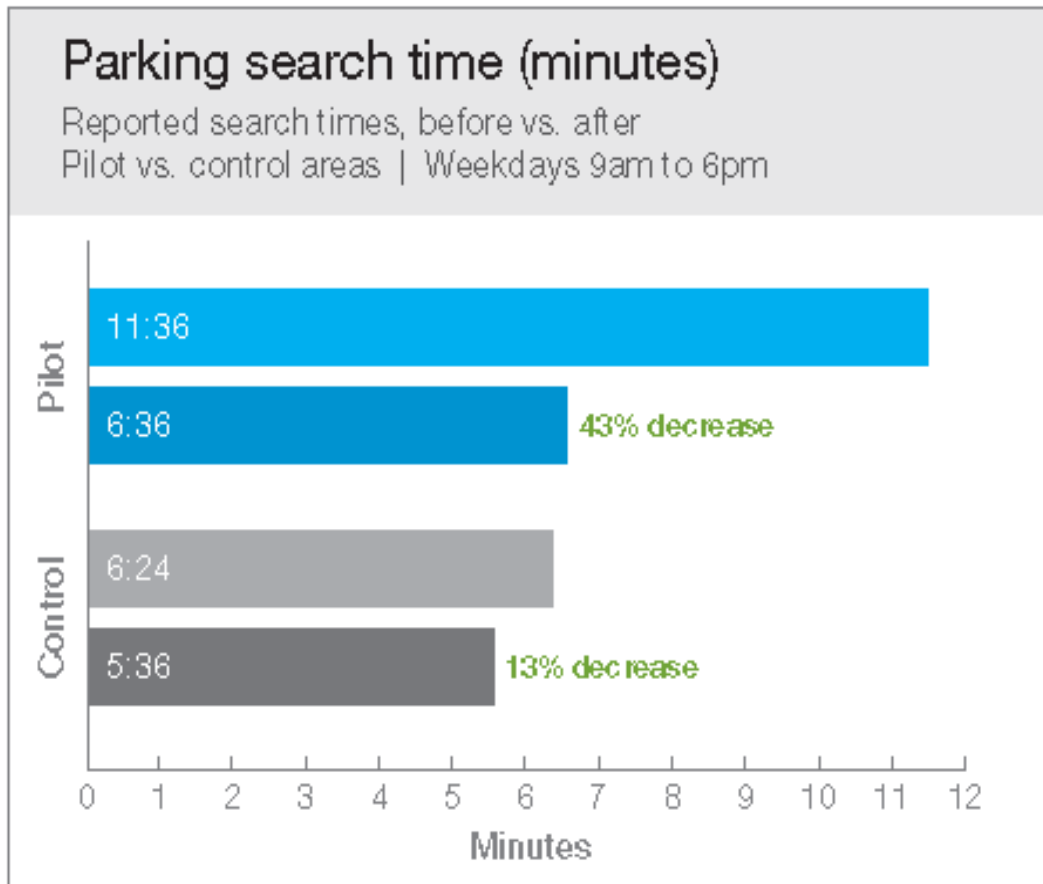
Best Practice: San Francisco

Sensors → Adaptive parking prices

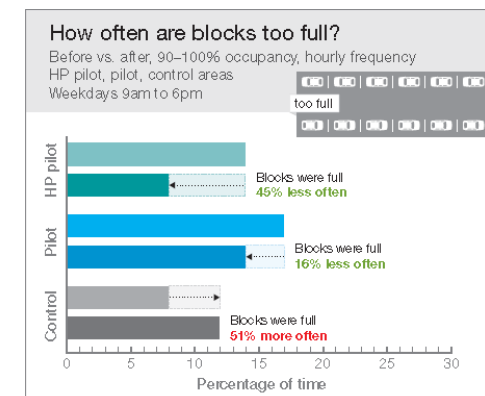
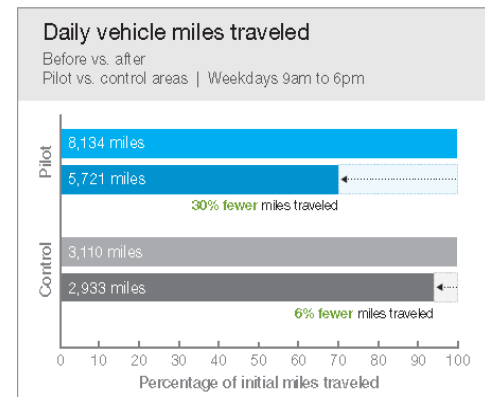
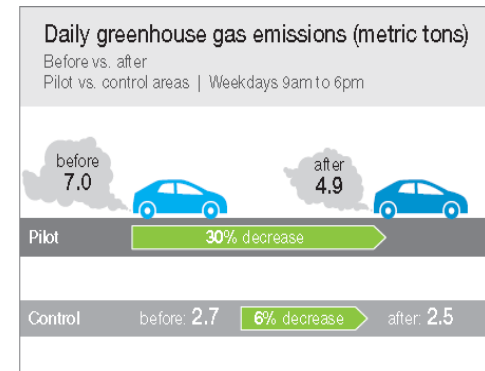


SF-Park really works!

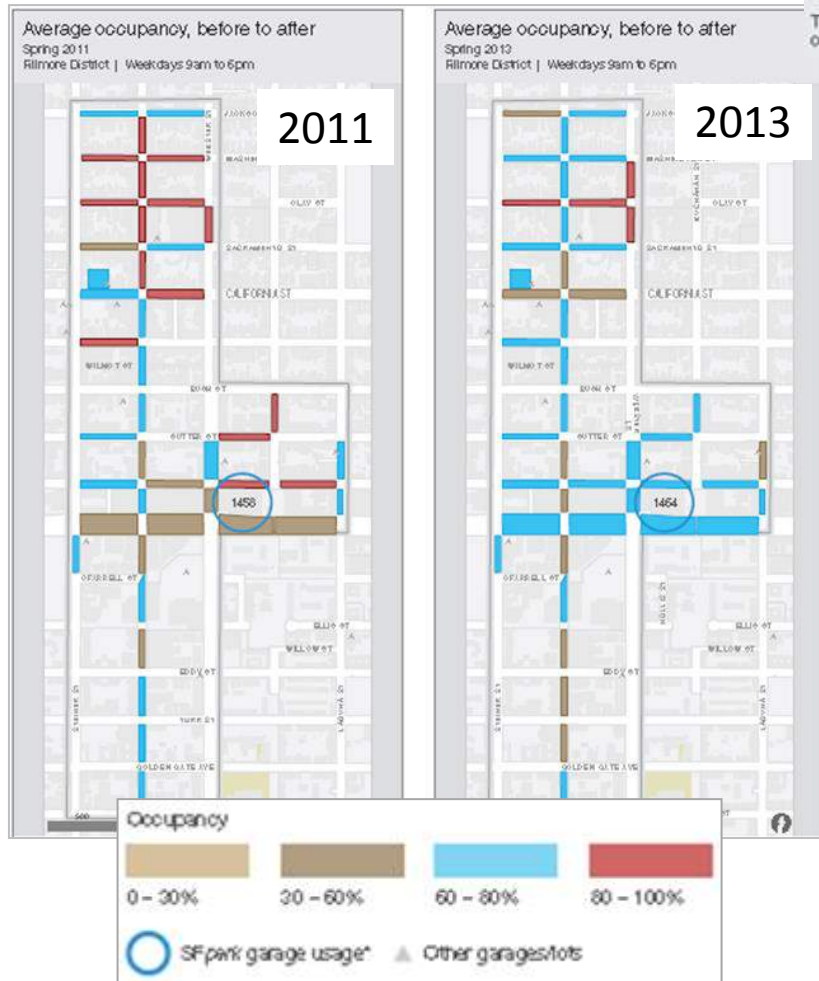
SF-PARK reduced 43% search time, 30% mileage, 30% emissions!



- ❑ 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/



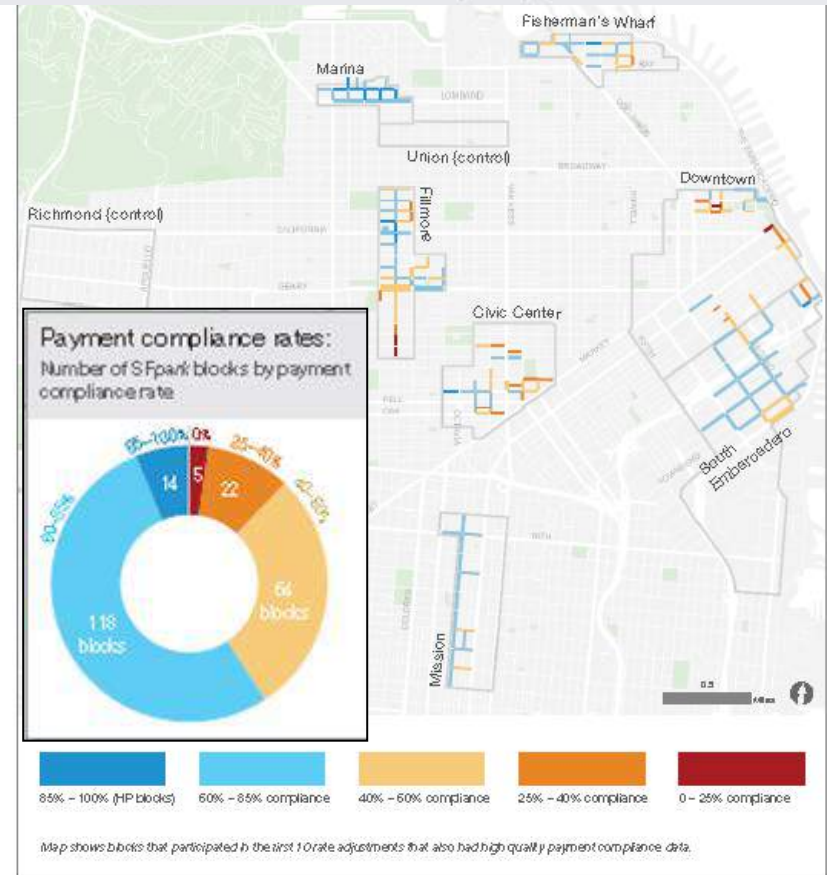
Parking is a heterogeneous phenomenon!



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.

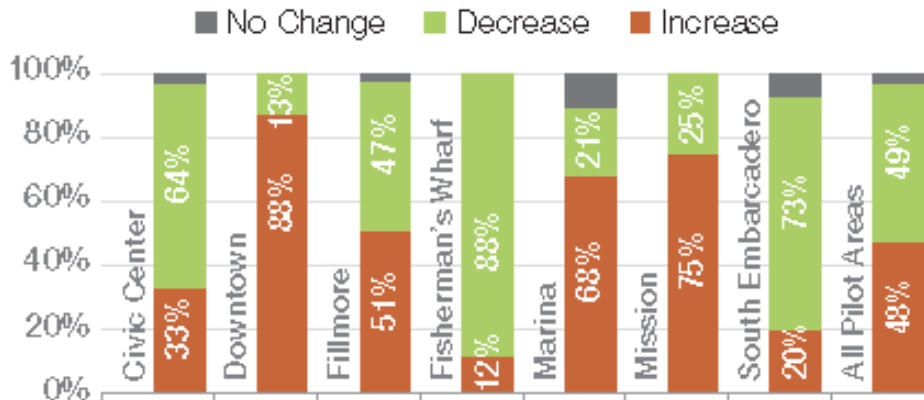


Readiness to pay is
heterogeneous too

To spread the demand uniformly we must react locally

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)



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



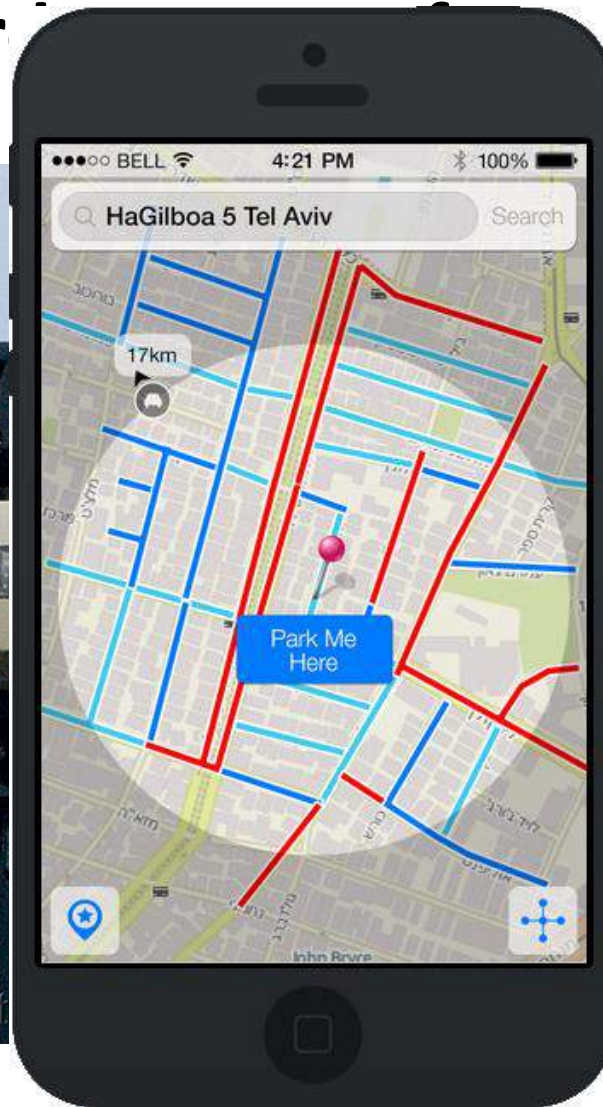
Hourly garage rate change, overall

● \$1.00 or more decrease
 ● \$0.01 to \$1.00 decrease
 ● No change
 ● \$0.01 to \$1.00 increase

Hourly meter rate change, overall

\$0.25 to \$4.00 decrease
 \$0.25 to \$0.01 decrease
 \$0.00 to \$0.25 increase
 \$0.25 to \$2.50 increase
 No overall rate change

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




Types of parking applications for the Smartphone

Type	are	set	e 3	ould nsfer on	Demands initial field survey	Demands Smartphone software	Forecasting capabilities	Reacts to real-time behavior of the others
	IPI INTERNATIONAL PARKING INSTITUTE 2013 Emerging Trends in Parking Report on a survey conducted by the International Parking Institute				✓	✓	✓	✓
*Reuse of privately owned	How famili					novations?		
*Drive parkin		Sustainability, and Parking <i>Which of the following do you believe has the greatest potential to improve sustainability in parking?</i>						✓
*Infor parkin		Guidance systems that enable drivers to find parking faster 57%						x
*Sens		Energy-efficient lighting 55%						✓
\$Optir search		Encouraging alternative travel 42%						x
		Automating payment processes 33%						✓
		Accommodating electric vehicles with charging stations 21%						✓
		Installing renewable energy technology 20%						x
		Solar panels 14%						✓
		Innovative water/stormwater management systems 11%						
		Using permeable pavement 9%						
		Using recycled building materials 7%						
		Innovative waste management systems 3%						

0% 10% 20% 30% 40% 50% 60%


Reuse of privately owned parking: ParkatmyHouse.com



The banner features a 3D illustration of a house with a blue roof and a large white 'P' on it, set on a green circular base. To the right, the text 'Smarter parking' is written in a script font above the 'ParkatmyHouse' logo. Below the logo is a search bar with the placeholder text 'Where do you need to park?' and a green search button. To the right of the search bar is an orange button that says 'Rent out your space'. Below the search bar are two input fields labeled 'From' and 'Until'. In the top right corner, there is a circular badge that says 'FREE TO LIST'. A large yellow banner with the text 'Very limited supply' is overlaid on the bottom part of the banner.


Very limited supply

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.

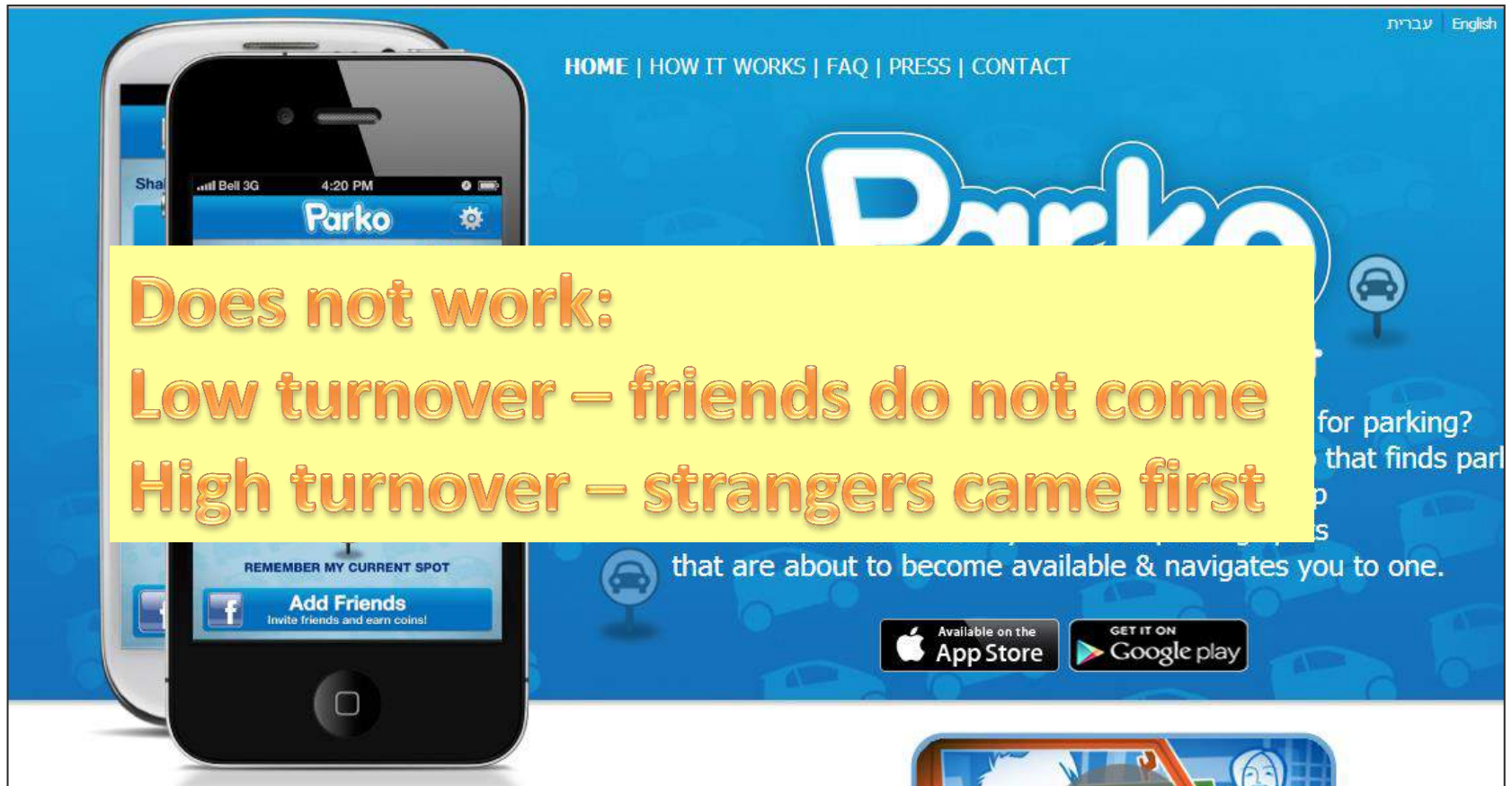


A video player showing a house with a large driveway. The text 'MONEY MADE £5,172,349' is displayed above the house. The video player has a red progress bar and a play button.



Logos of partner media outlets: 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. The background is blue with a pattern of small car icons. At the top, there is a navigation bar with links: HOME | HOW IT WORKS | FAQ | PRESS | CONTACT. In the top right corner, there are language options: עברית | English. The main heading 'Parko' is in a large, white, stylized font. Below the heading, there is a yellow rectangular box with orange text that reads: 'Does not work: Low turnover – friends do not come High turnover – strangers came first'. To the left of this box, there is a smartphone displaying the Parko app interface. The app shows a status bar at the top with 'Bell 3G' and '4:20 PM'. Below that, the 'Parko' logo is visible. At the bottom of the app screen, there is a section titled 'REMEMBER MY CURRENT SPOT' with a button labeled 'Add Friends' and the text 'Invite friends and earn coins!'. To the right of the yellow box, there is a parking sign icon and some text: 'for parking? that finds parl'. At the bottom of the website, there are two buttons: 'Available on the App Store' and 'GET IT ON Google play'. The overall layout is clean and modern.

HOME | HOW IT WORKS | FAQ | PRESS | CONTACT

עברית | English

Parko

for parking?
that finds parl

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

Available on the App Store

GET IT ON Google play

REMEMBER MY CURRENT SPOT

Add Friends
Invite friends and earn coins!

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: Home, About Us, Developers, Parking Operators, Terms of Service, and Contact Us. Below this is a banner featuring the BestParking.com logo, a city skyline, and icons for mobile apps (iPhone & iPad, Android, Mobile Site, BlackBerry 10). The main heading reads "NYC Parking - Find. Compare. Save." followed by "Parking Garage Coupons & On-Street Regulations". A yellow banner with orange text states "Useful, but ignores on-street parking". Below this, a map of Times Square in NYC is shown with various parking spots marked with price tags (e.g., \$25, \$35, \$40, \$47, \$50, \$55, \$59, \$76). On the left side, there are filters for "Garage/Lot Legend" (Rates Updated Quarterly, Rates Guaranteed w/ Coupon, Reservation Enabled) and "On-Street Legend" (Free, Metered*, Prohibited*). The bottom of the map shows "Map data ©2014 Google" and "Report a map error".

Home About Us Developers Parking Operators Terms of Service Contact Us

BestParking.com

NYC Parking - Find. Compare. Save.
Parking Garage Coupons & On-Street Regulations

Useful, but ignores on-street parking

Arrive: Jun 24 4:30 PM
Depart: Jun 24 7:30 PM

Garage/Lot Legend

- Rates Updated Quarterly
- Rates Guaranteed w/ Coupon
- Reservation Enabled


On-Street Legend

- Free
- Metered*
- Prohibited*

*For some or all of the time period searched

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

Optimal Parking search: PARKNAV



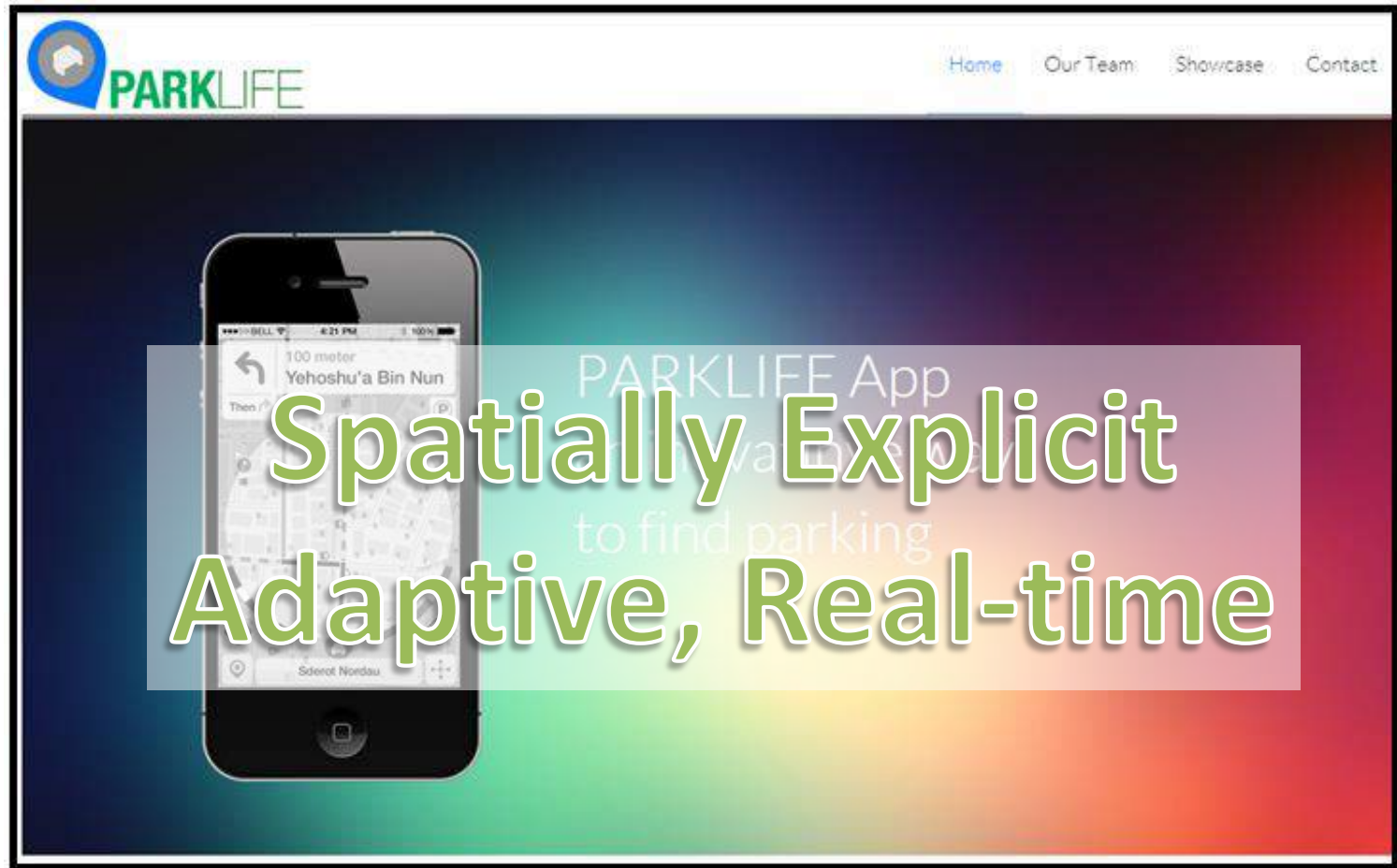
HOME TRY IT FREE PRICING ABOUT CONTACT

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".

[+ ADVANCED SEARCH](#)

**Spatially Explicit,
not Real-Time**

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...

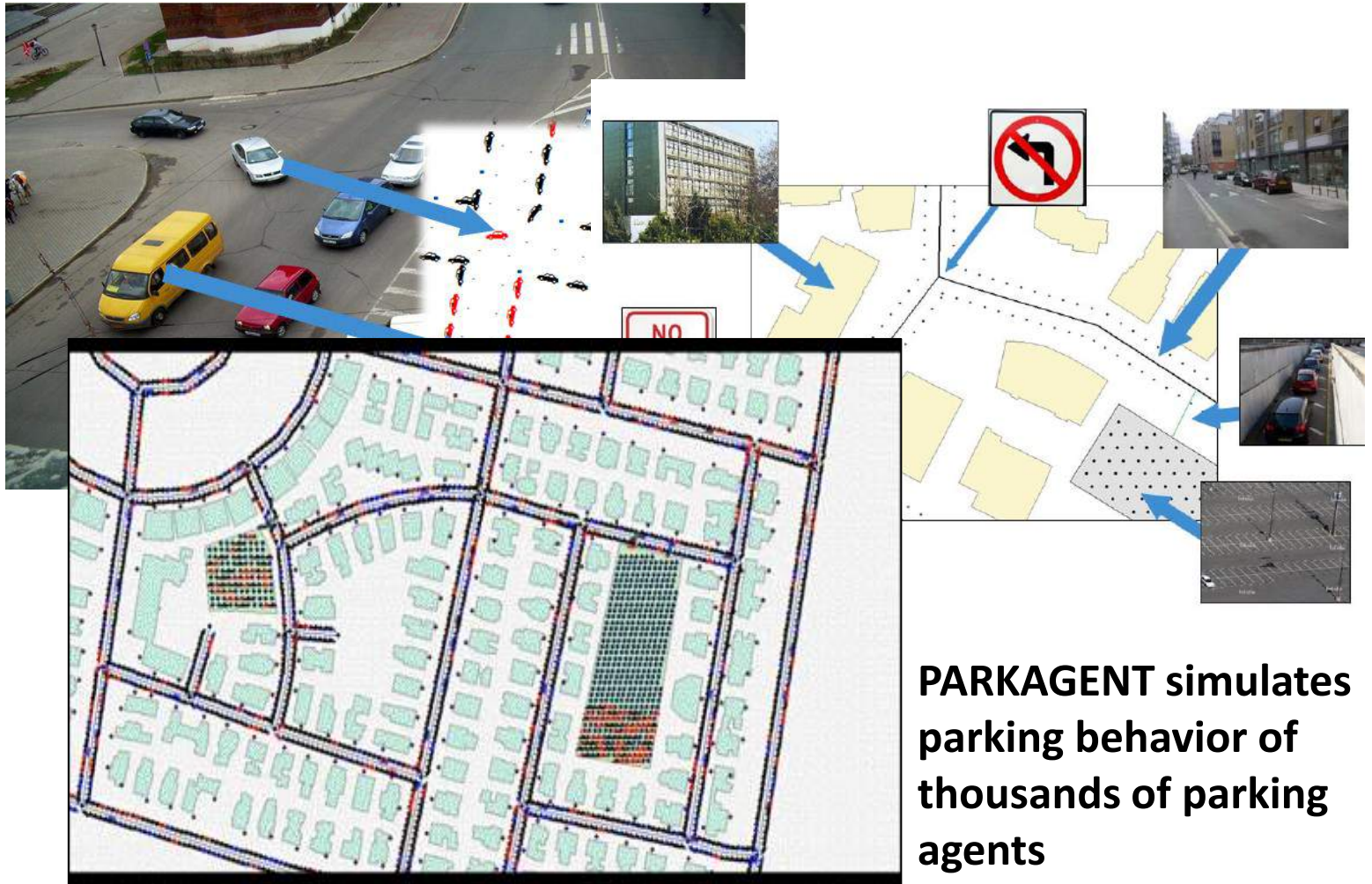
Can we test them before implementation?

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

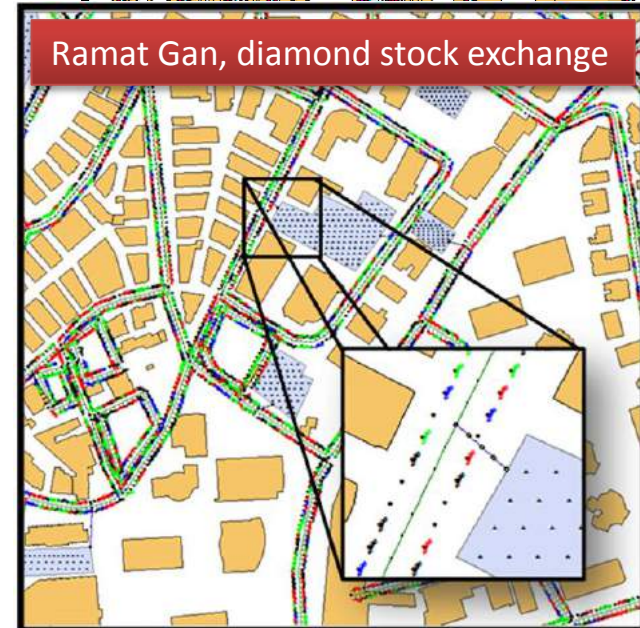
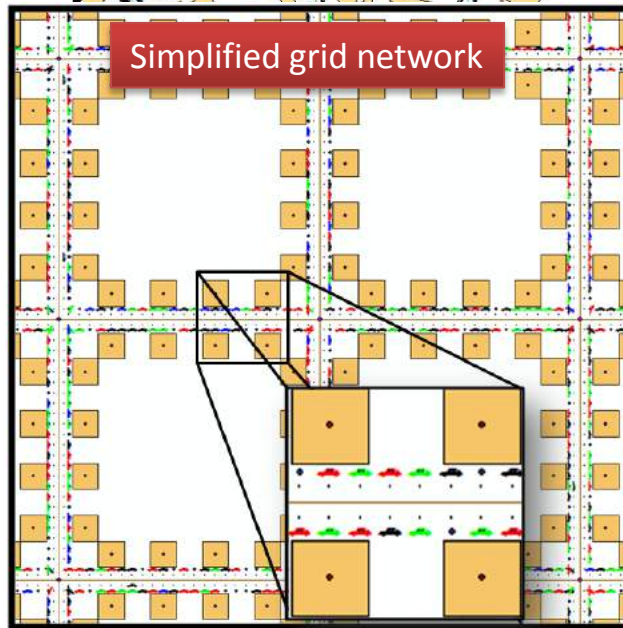
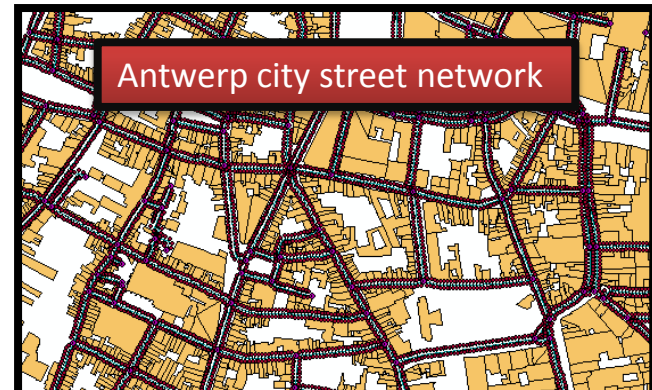
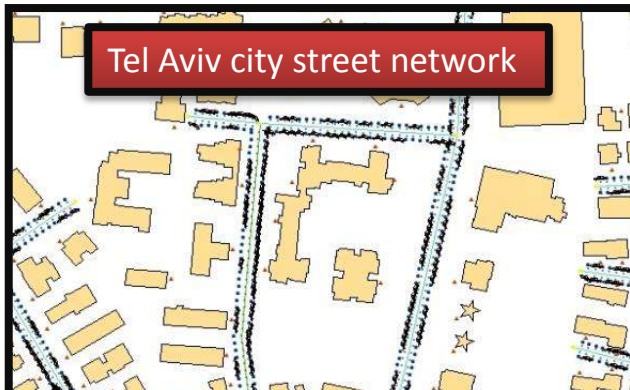


Our solution: PARKAGENT, an Agent-Based Model of Parking Search

-  Residents
-  Commuters
-  Guests
-  Customers



PARKAGENT is easily adjustable



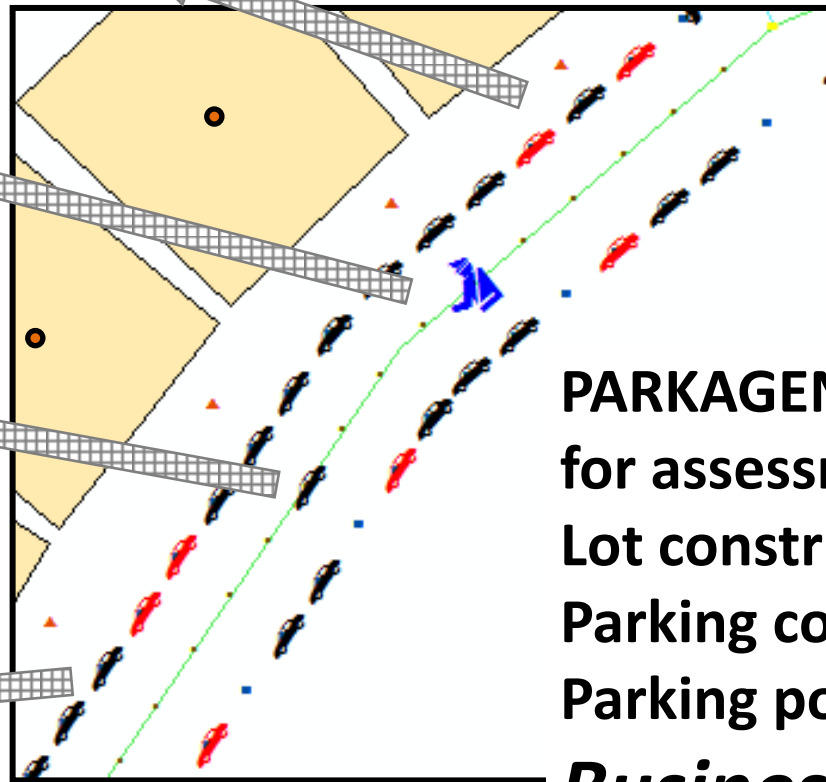
PARKAGENT imitates ICT tools and supplies all policy-important outputs:

Occupancy rate per street

No of issued tickets

Cruising time

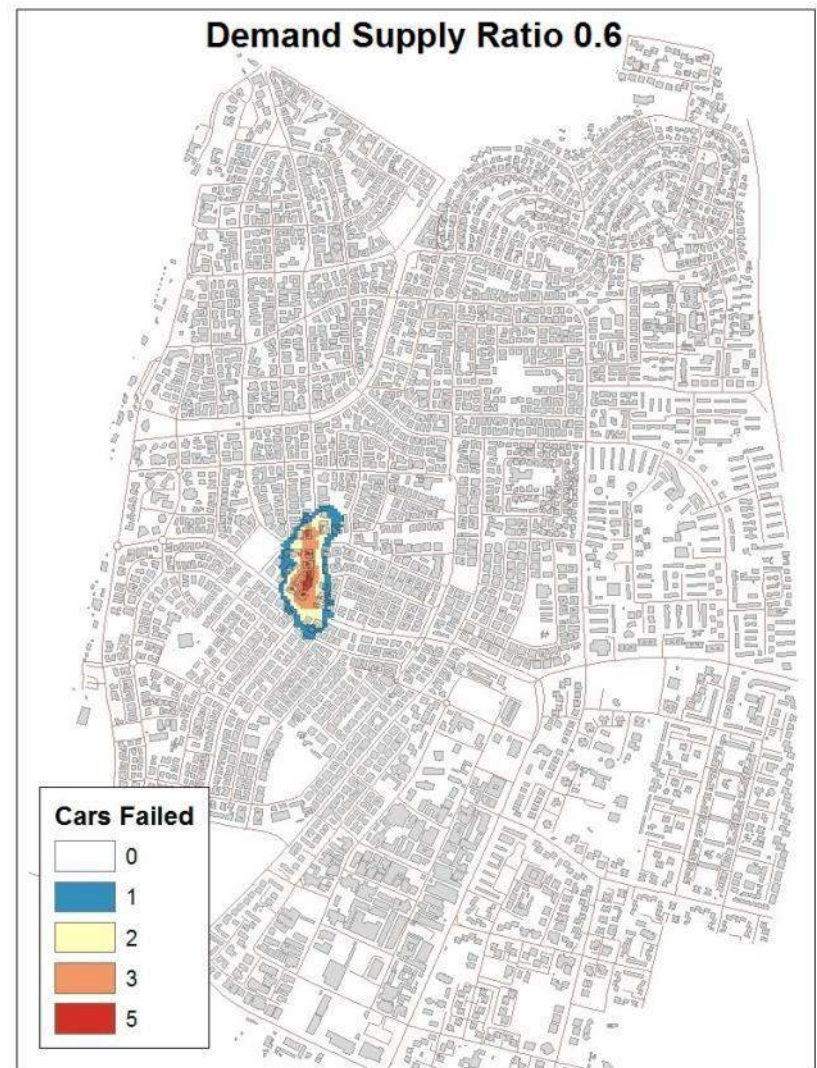
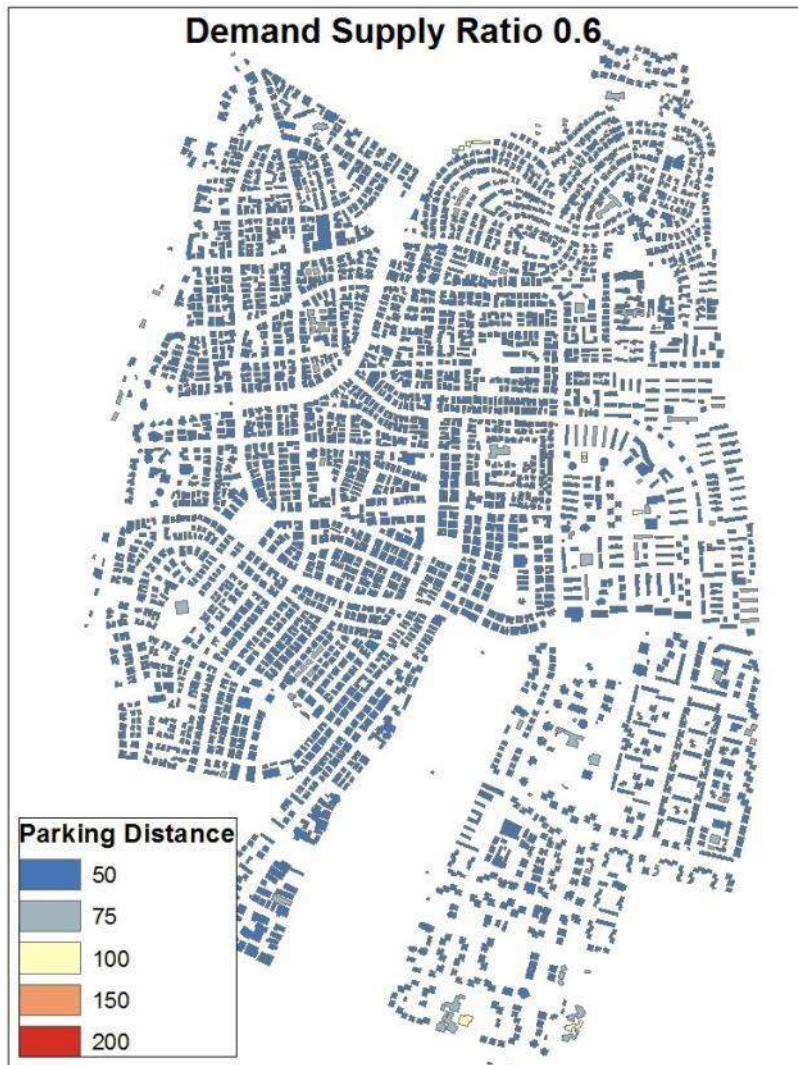
Distance to Destination



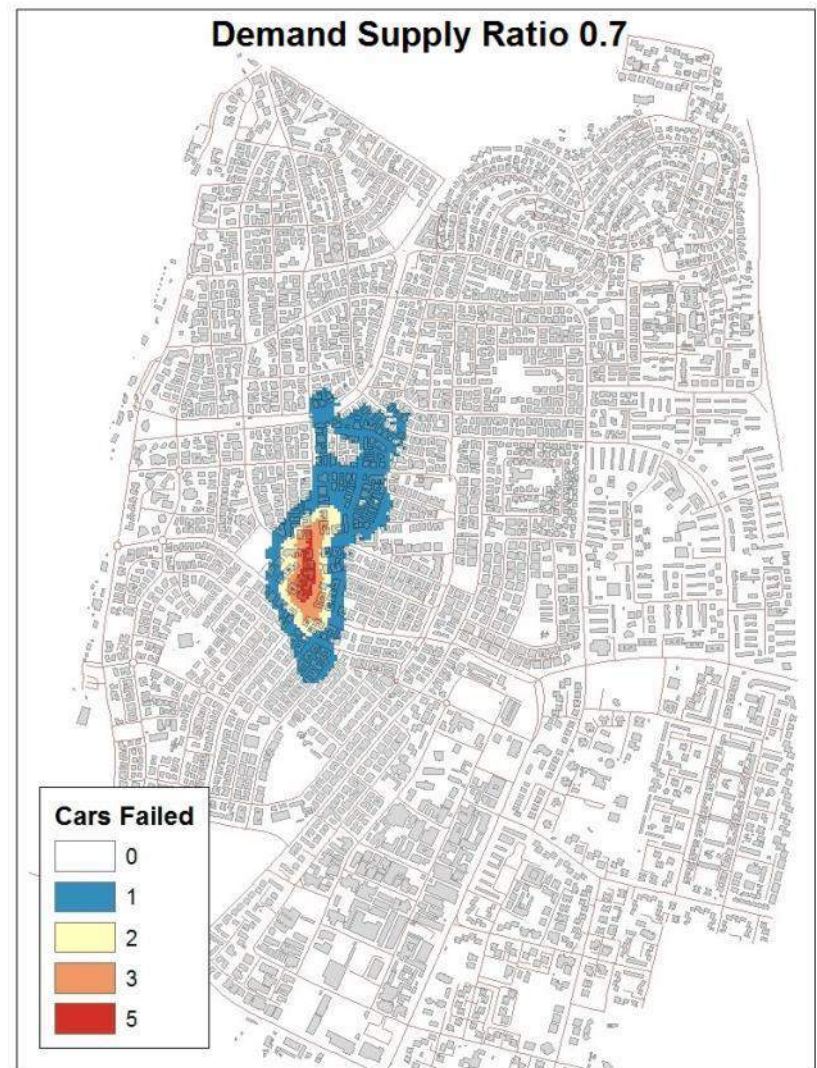
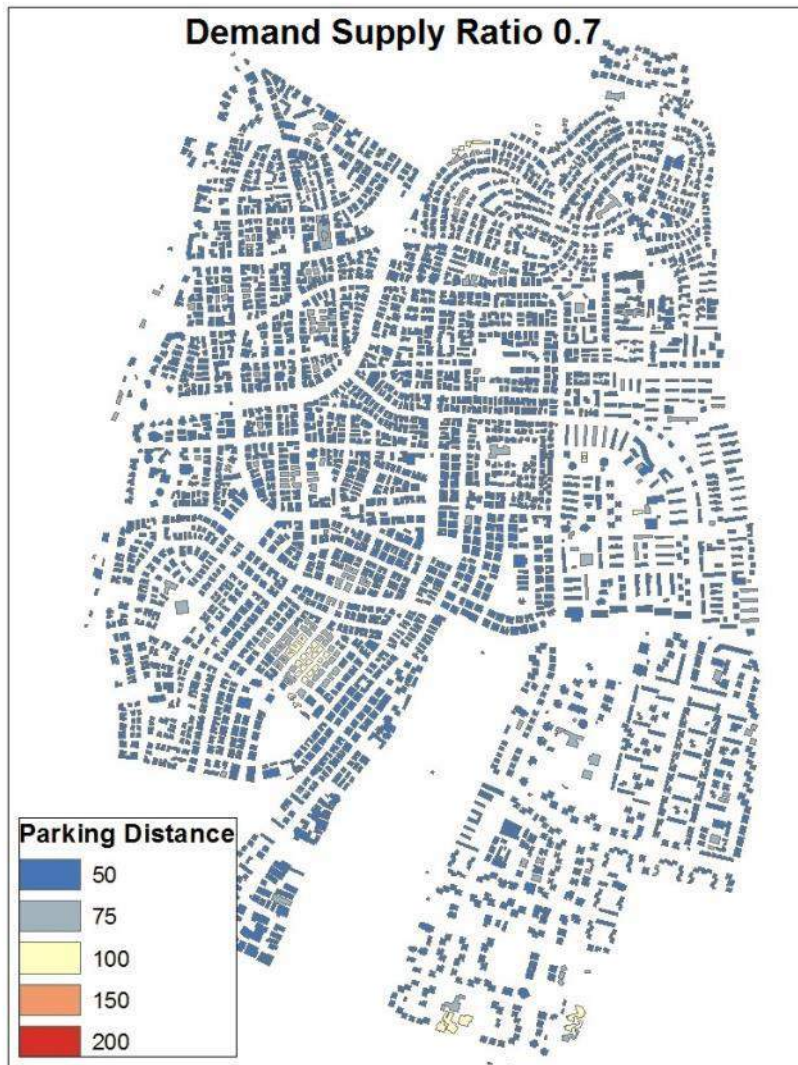
**PARKAGENT was used
for assessment of:
Lot construction projects,
Parking control,
Parking policy,
*Business models***

.....

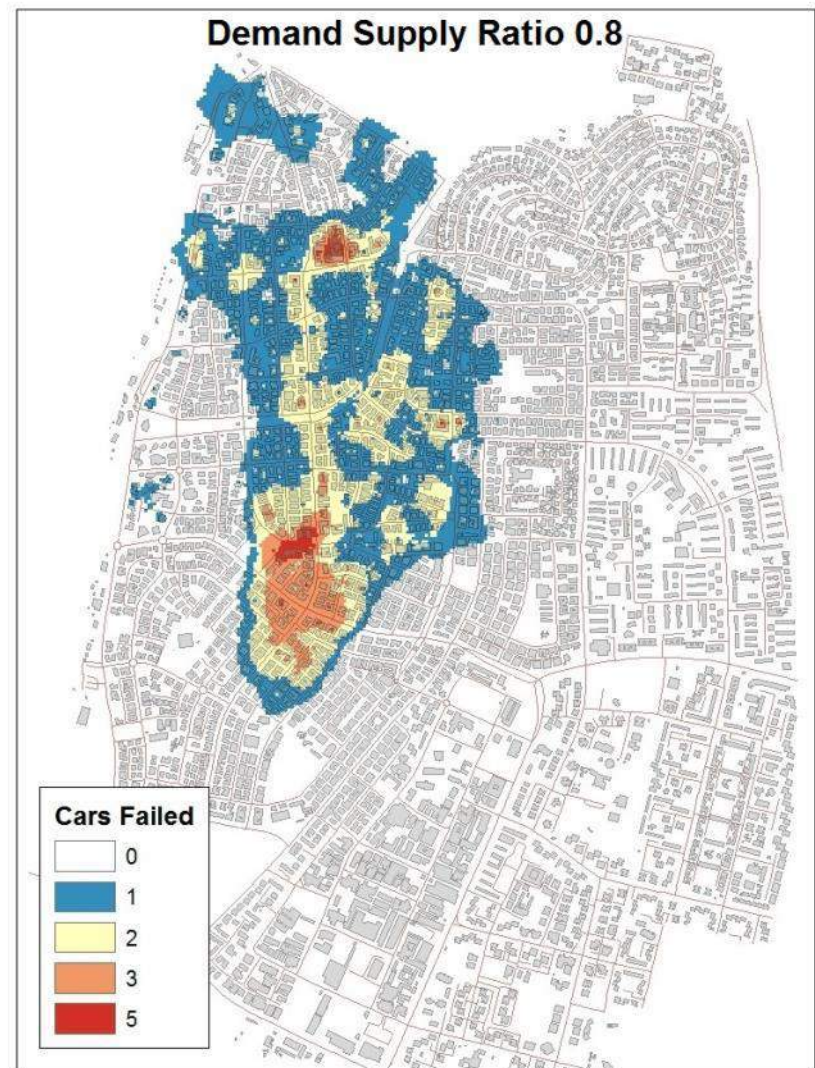
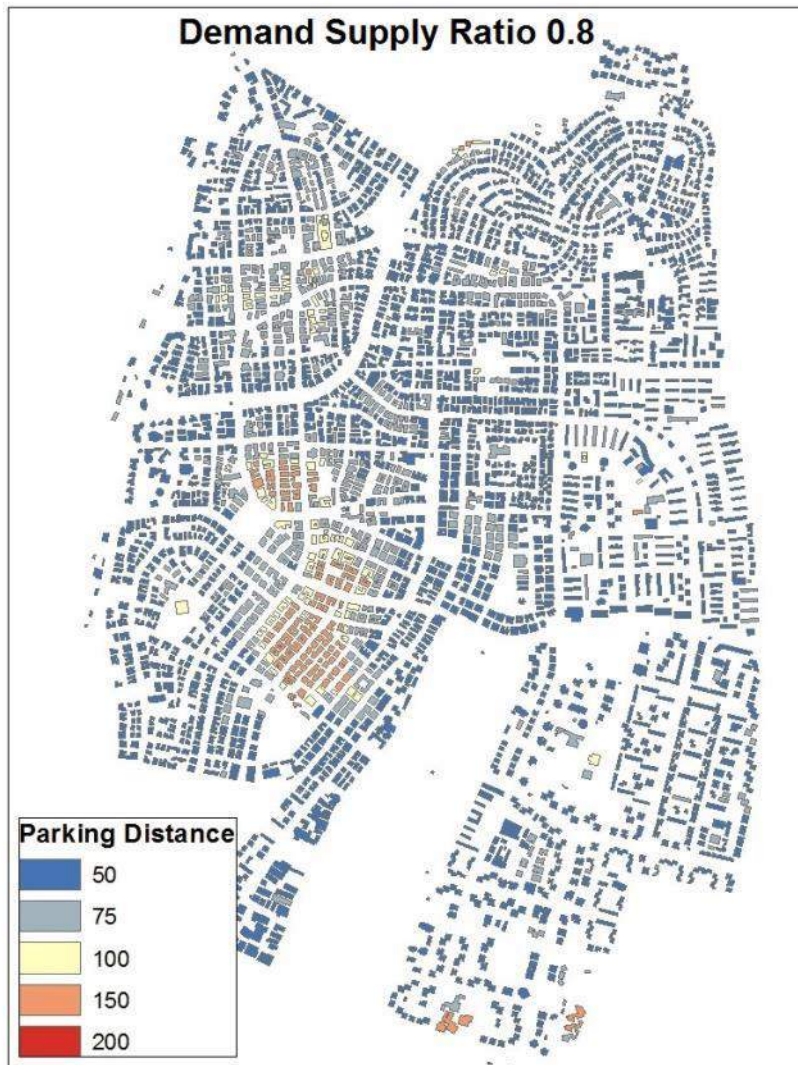
Towards SF-Park assessment: overnight parking



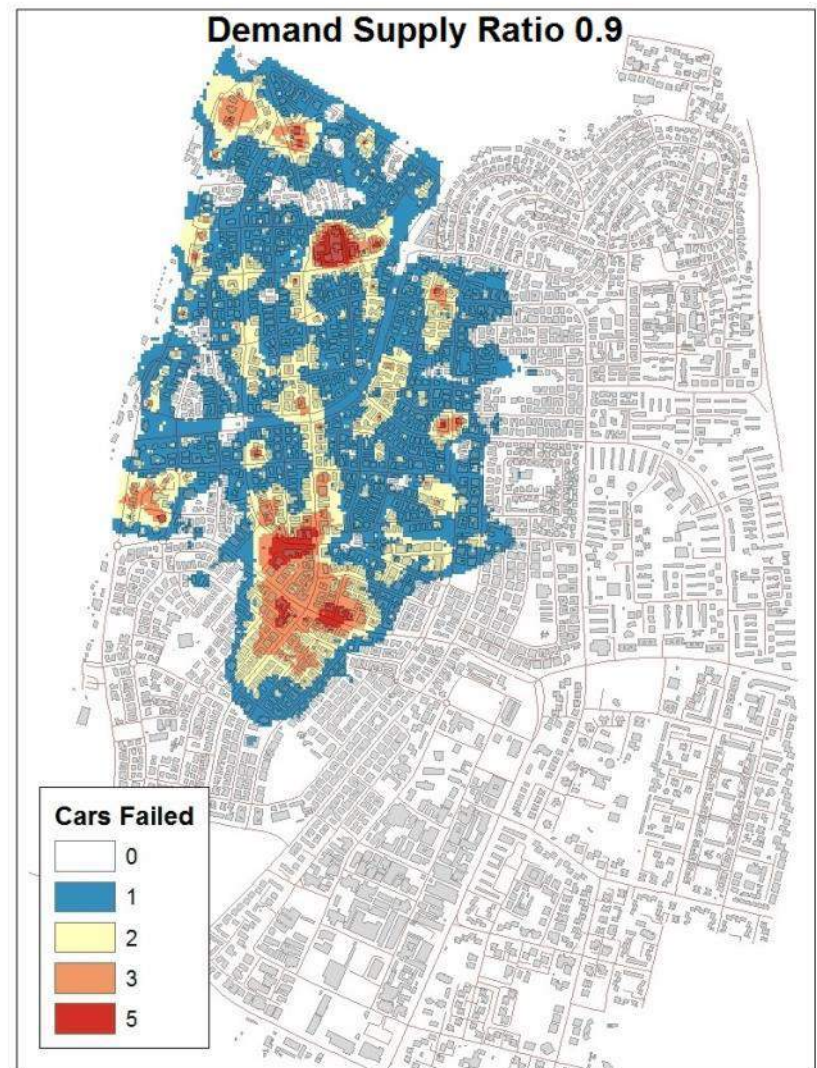
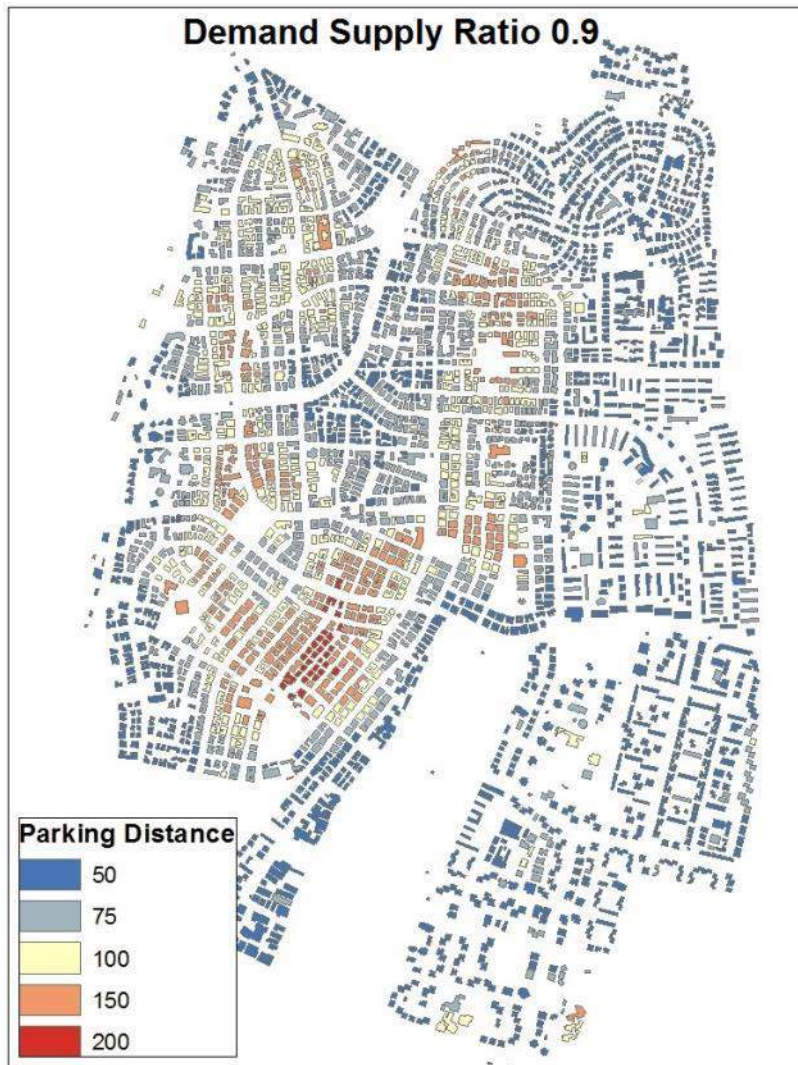
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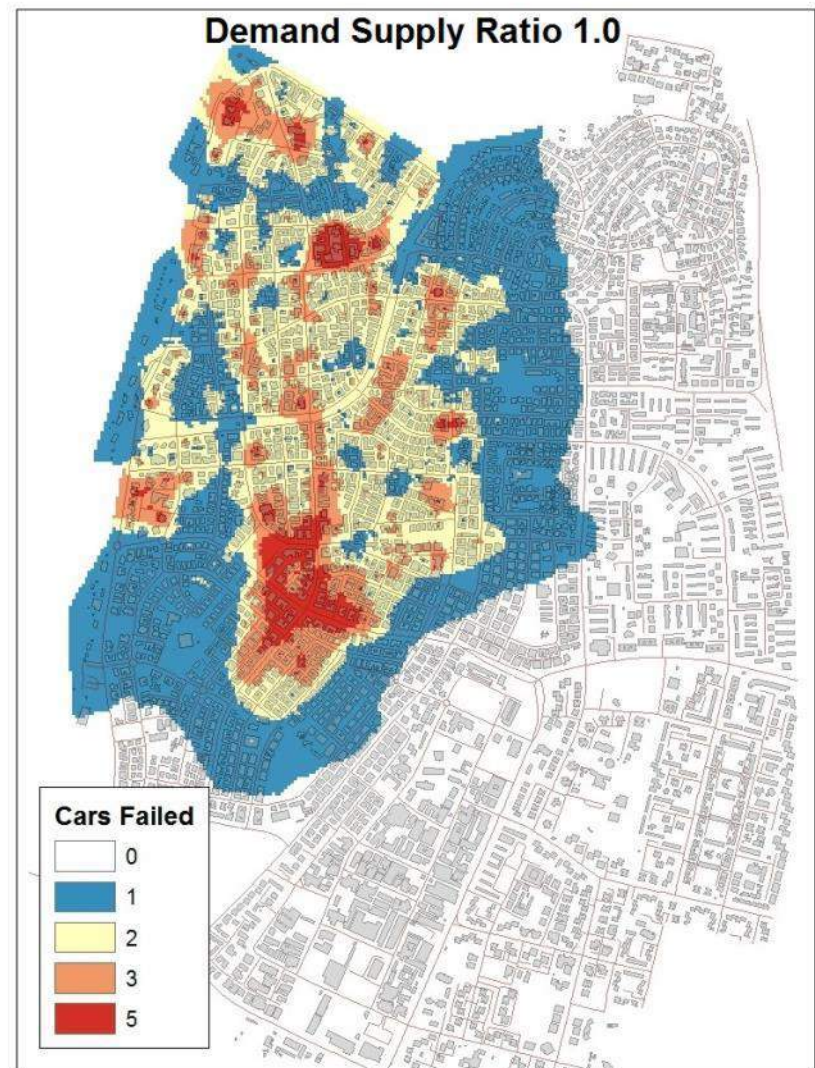
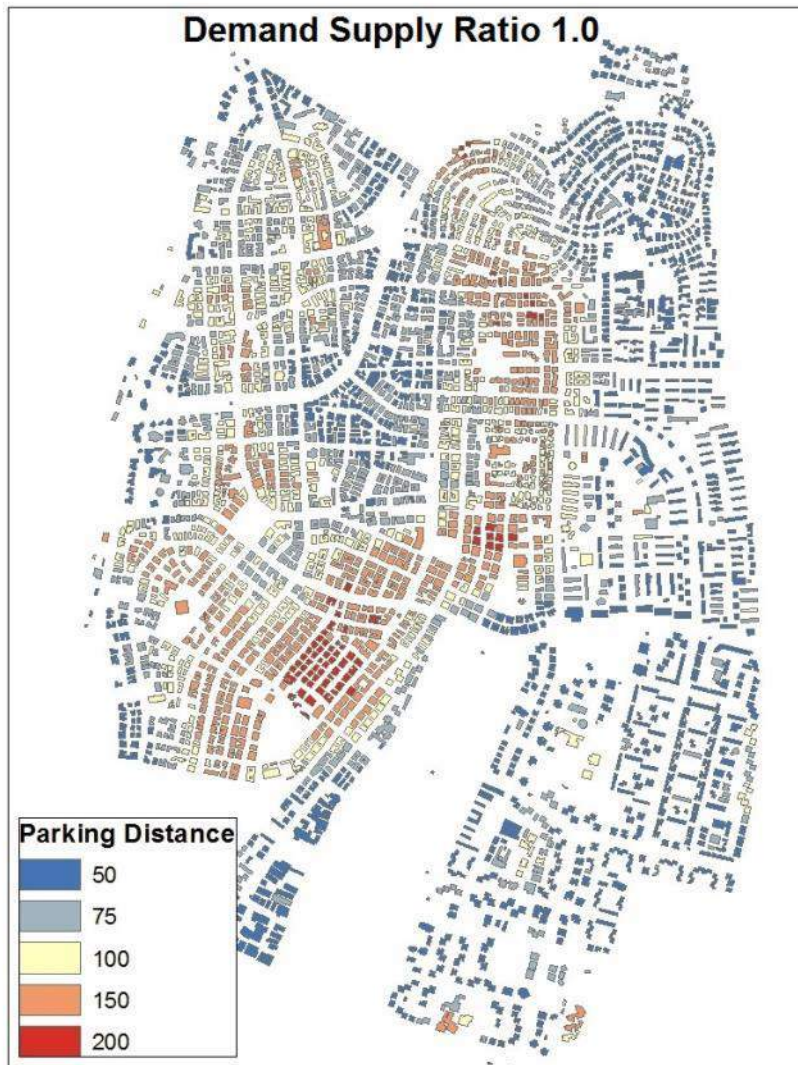
Towards SF-Park assessment: overnight parking



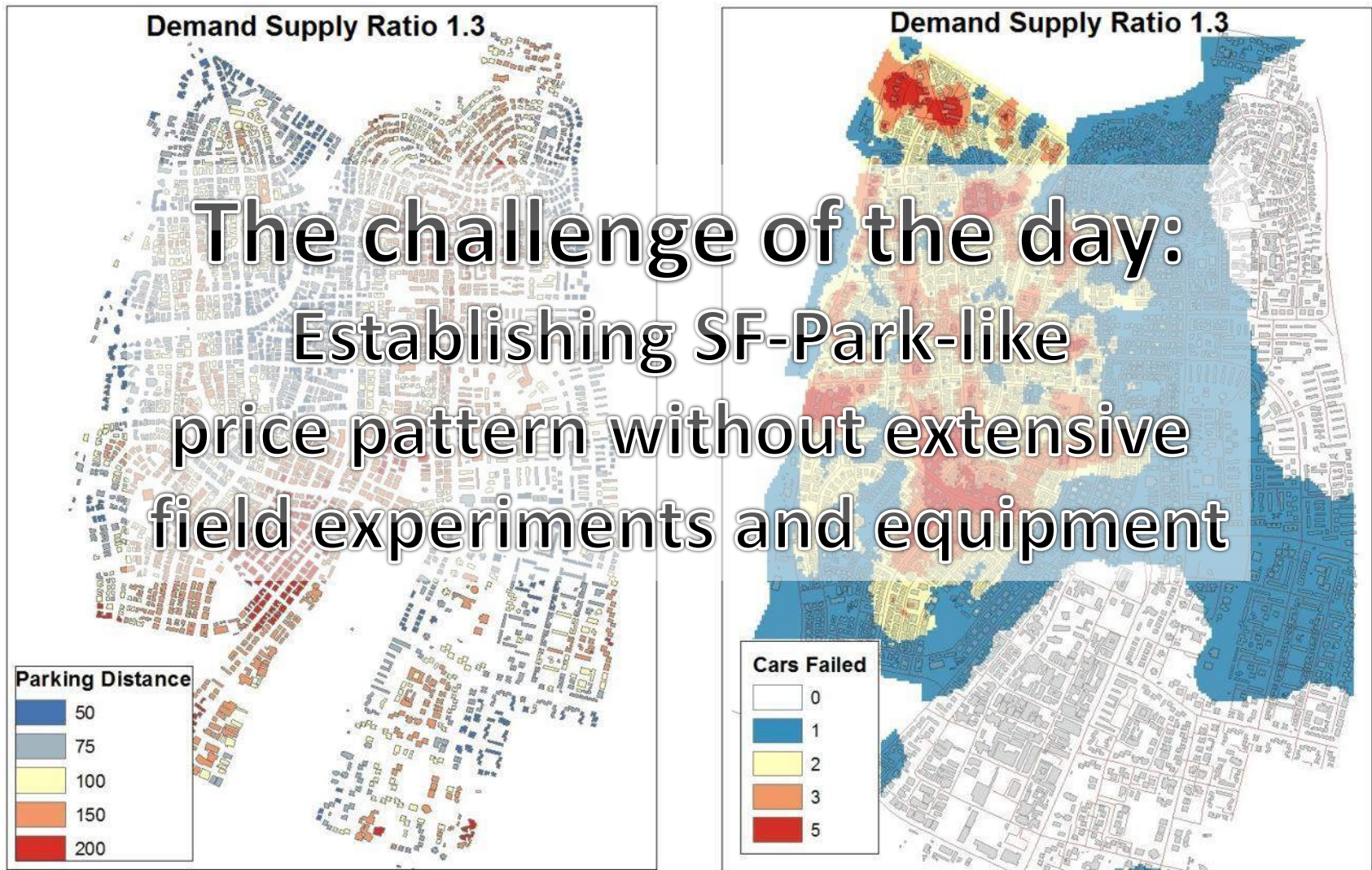
Towards SF-Park assessment: overnight parking



Towards SF-Park assessment: overnight parking



Towards SF-Park assessment: overnight parking



HERE GOES ICT FUTURE OF PARKING

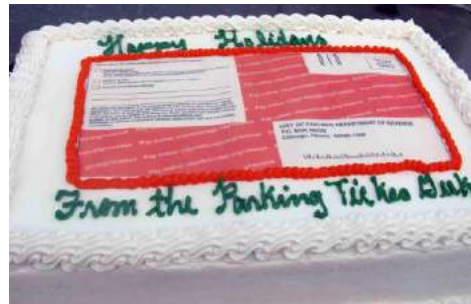
ICT: DEMAND *PATTERN*

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!