

CAPRI: Congestion And Parking Relief Incentives



STANFORD UNIVERSITY



Stanford Center for Societal Networks
scsn.stanford.edu

Decongesting campus road networks using incentives

Hossein Karkeh Abadi, Chinmoy Mandayam, Jia Shuo Yue, Chenguang Zhu, Deepak Merugu, Balaji Prabhakar



STANFORD UNIVERSITY
P&TS
Parking & Transportation Services



U.S. Department of Transportation
Federal Highway Administration

Transportation networks and congestion

- Cost of congestion in wasted fuel and time¹
 - United States: \$121 billion in 2011
 - Estimated to cross \$199 billion in 2020
- Traffic causes 31% of all US CO₂ emissions²
- Public transit: overcrowding
- Current solutions:
 - Congestion pricing, road rationing
 - Viewed as just another tax
 - Usually requires enforcement and political mandate
 - Capacity addition: expensive and limited



Miami, Florida

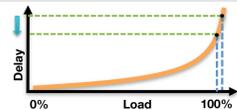


Tokyo, Japan

- Texas Transportation Institute
- U.S. Energy Information Administration

Our approach

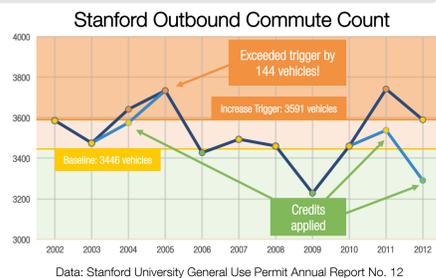
- "Congestion is a 10% phenomenon"
 - A small reduction in the load can lead to a significant drop in congestion
- Incentivize decongestion: carrots, not sticks
- Accurate sensing of user behavior
- Pay random chunky rewards instead of small, deterministic payments



"in games with low stakes, players are more risk-seeking"

Congestion problems at Stanford

- Agreement with Santa Clara County:
 - Limit peak hour traffic
 - Fines and restrictions for exceeding the limit
- Current solutions:
 - Cash rewards for not driving
 - Reserved parking spaces for carpools
 - Discount transit passes
 - etc.

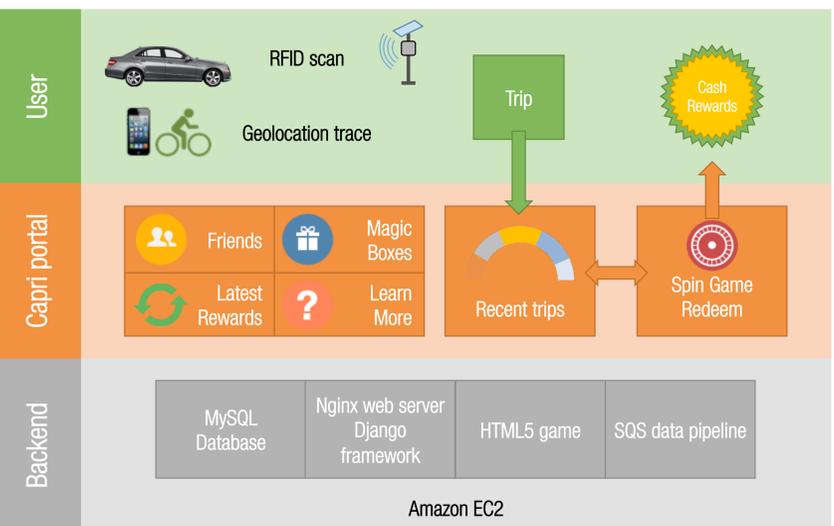


Data: Stanford University General Use Permit Annual Report No. 12

Capri CAPRI: stanfordcapri.org

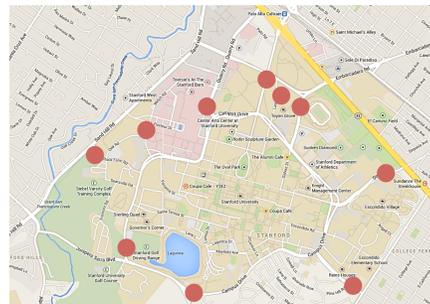


Goal: Incentivize off-peak and walking / biking mode commutes



Incentives

Auto commutes: RFID



Inbound Outbound
7-8AM 8-9AM 9-10AM 4-5PM 5-6PM 6-7PM
Off-peak commutes earn 10 points each.

Walking / biking commutes: app

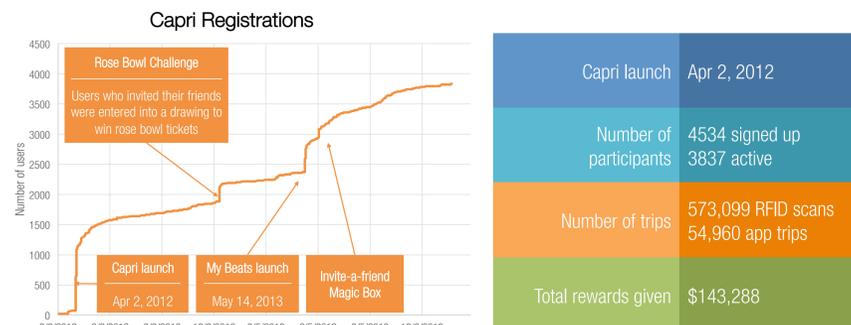


Commutes are rewarded by duration.
Boost day: 3x credits for eligible trips on chosen day of the week.

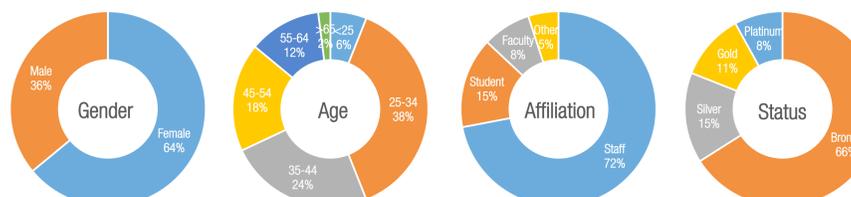
Personalization and "Trendjacking"

- Each week, select some users to receive magic boxes
 - based on current commute behavior, propensity to shift, etc.
- Use popular events around Stanford to promote Capri
 - The Big Game
 - Rose Bowl Game
 - Other events
- Increased enrollment and participation

Statistics (as of Jan 28, 2014)

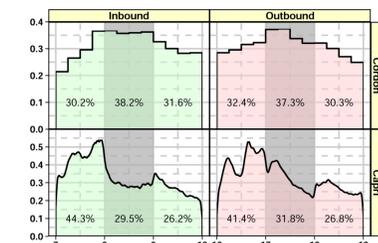


| | |
|------------------------|--|
| Capri launch | Apr 2, 2012 |
| Number of participants | 4534 signed up 3837 active |
| Number of trips | 573,099 RFID scans 54,960 app trips |
| Total rewards given | \$143,288 |

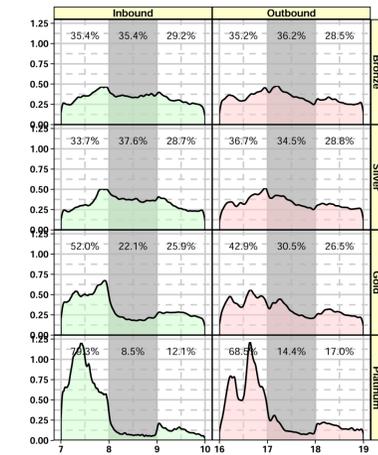


Results

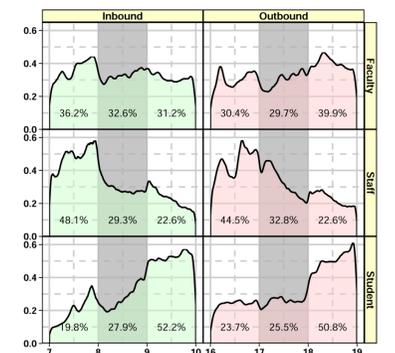
RFID Commute Density



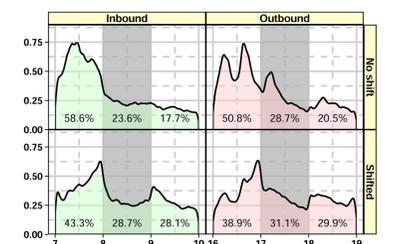
Capri users commute less during peak hours compared to the general Stanford population.



There are users who carefully avoid the peak hour; these users have high "status".



Staff shift earlier; students shift later.



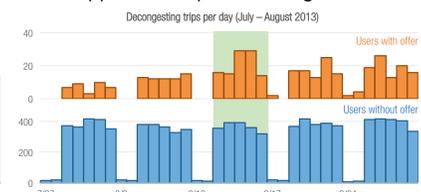
We surveyed users about behavior shift. Users who said they "did not shift" were already off-peak prior to joining Capri. Users who said they "shifted", shifted the minimum amount to receive incentives.

Friend Invitation Magic Box



Magic box boosted registrations by 94% over previous week.

App-based Trip Bonus Magic Box



Users with offer increased performance by 61% over previous week.

Conclusions

Capri aims to mitigate the traffic congestion problem in Stanford, especially during peak hours. With incentives through games, personalized offers and trendjacking, we observe behavior shifts in users' commutes: more commutes during off-peak hours and walking / biking commutes.

Related work

- "An Incentive Mechanism for Decongesting the Roads: A Pilot Program in Bangalore", D. Merugu, B. Prabhakar, N. S. Rama, *NetEcon, ACM Workshop on the Economics of Networked Systems*, July 2009.
- "Steptacular: an incentive mechanism for promoting wellness", N. Gomes, D. Merugu, G. O'Brien, C. Mandayam, J. Yue, B. Atikoglu, A. Albert, N. Fukumoto, H. Liu, B. Prabhakar, D. Wischik, *NetHealth, Comsnets Workshop on Networked Healthcare Technology*, January 2012.

Media coverage

