

Partial Control of Agents on Networks and Applications to Rerouting a Subset of Drivers on Freeways

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Users drive selfishly

Route choice models

- **User equilibrium (natural)**

- All occupied routes have same travel time
- Overuse of shortest routes can cause congestion and delays
- Suboptimal **total** travel time for society

- **Social equilibrium (controlled)**

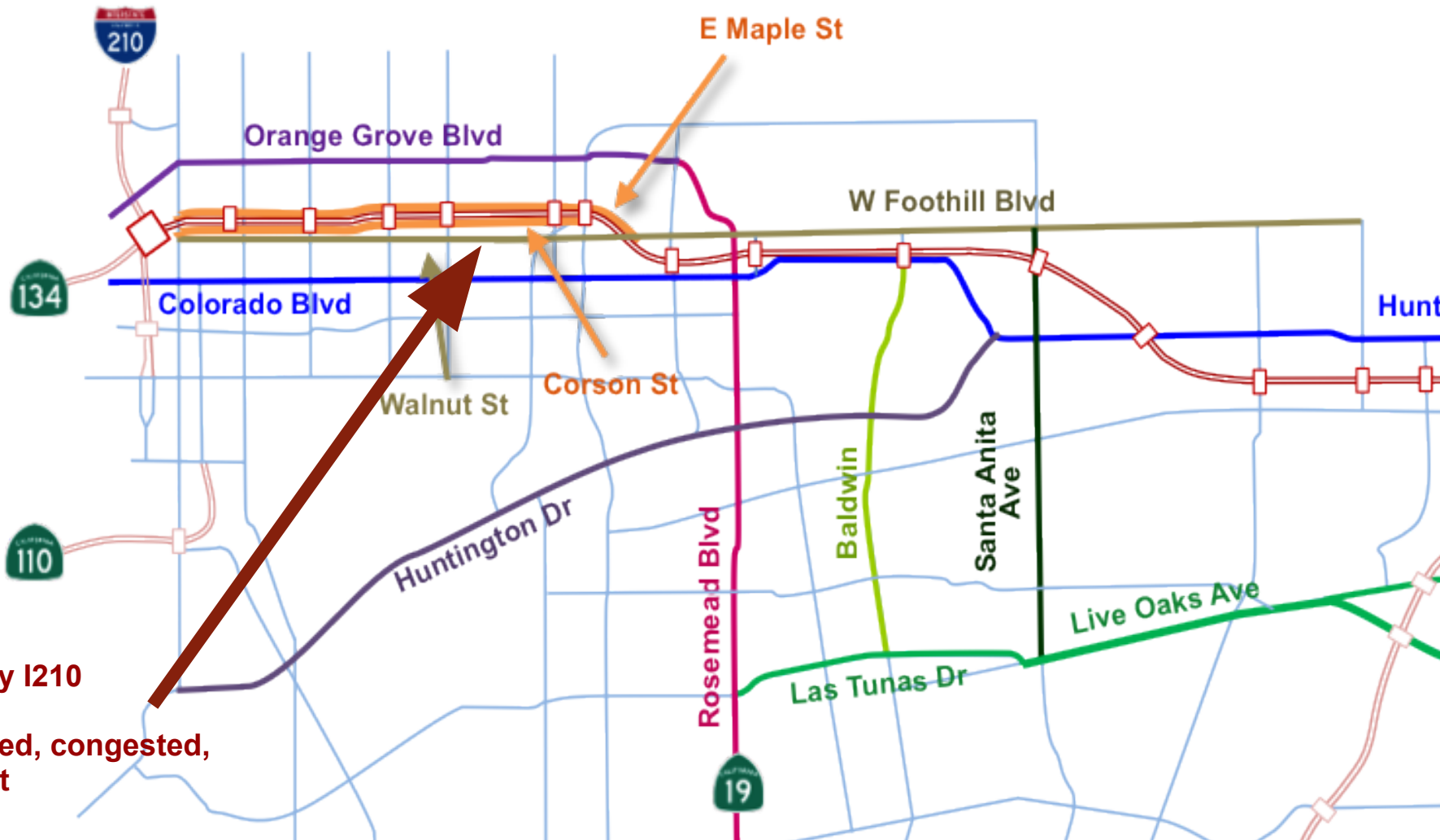
- Optimal total travel time
- Some drivers may experience longer travel times than others

HOW TO DRIVE ROUTE CHOICE FROM UE->SO?

Approach: Partial Control

- Assume most drivers drive according to UE
- Assume a fraction α of drivers will have routes chosen by central controller:
 - Uncontrolled drivers may have to pay tax
 - Or controlled drivers receive some incentive.

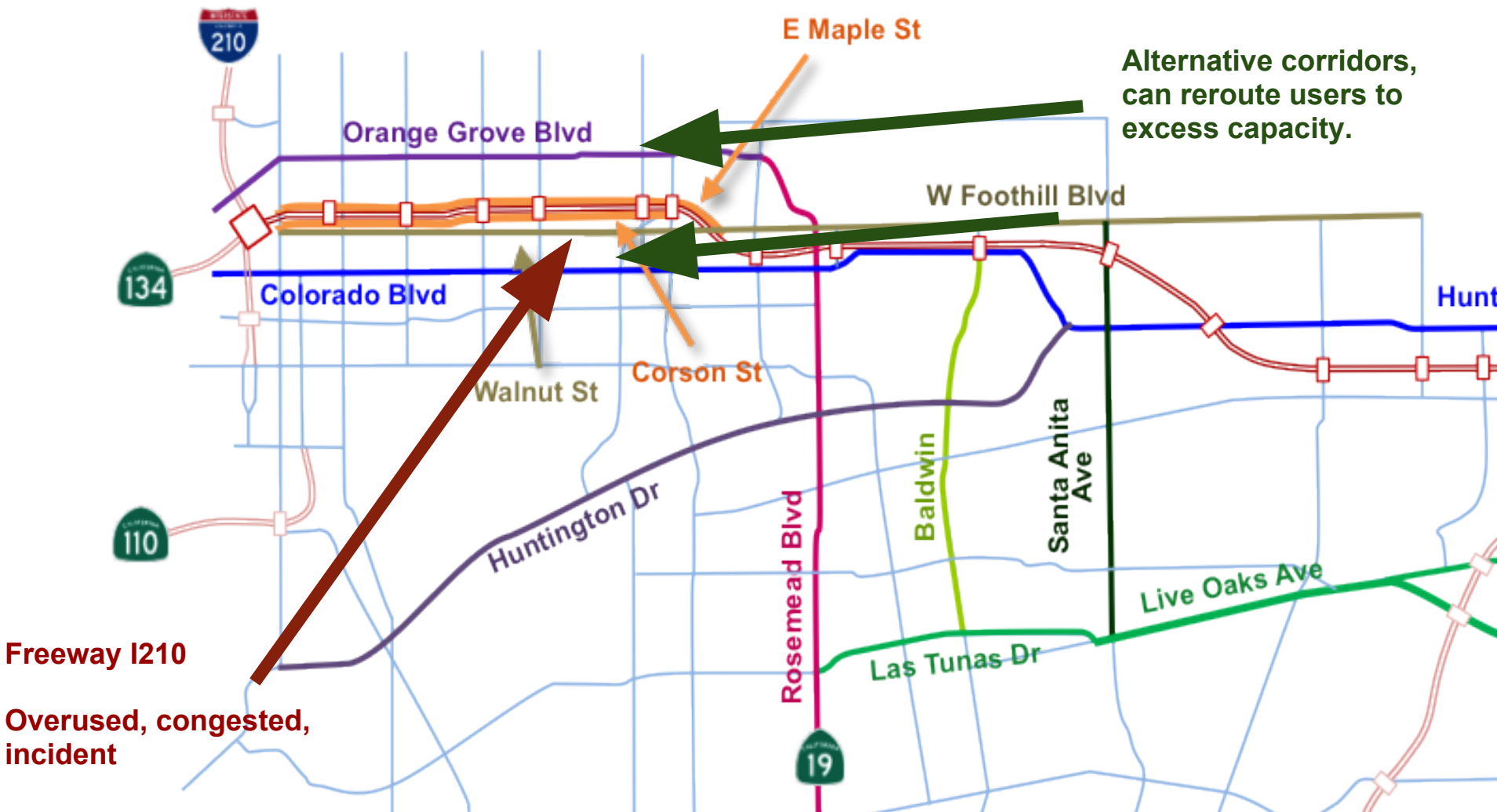
Freeway corridor



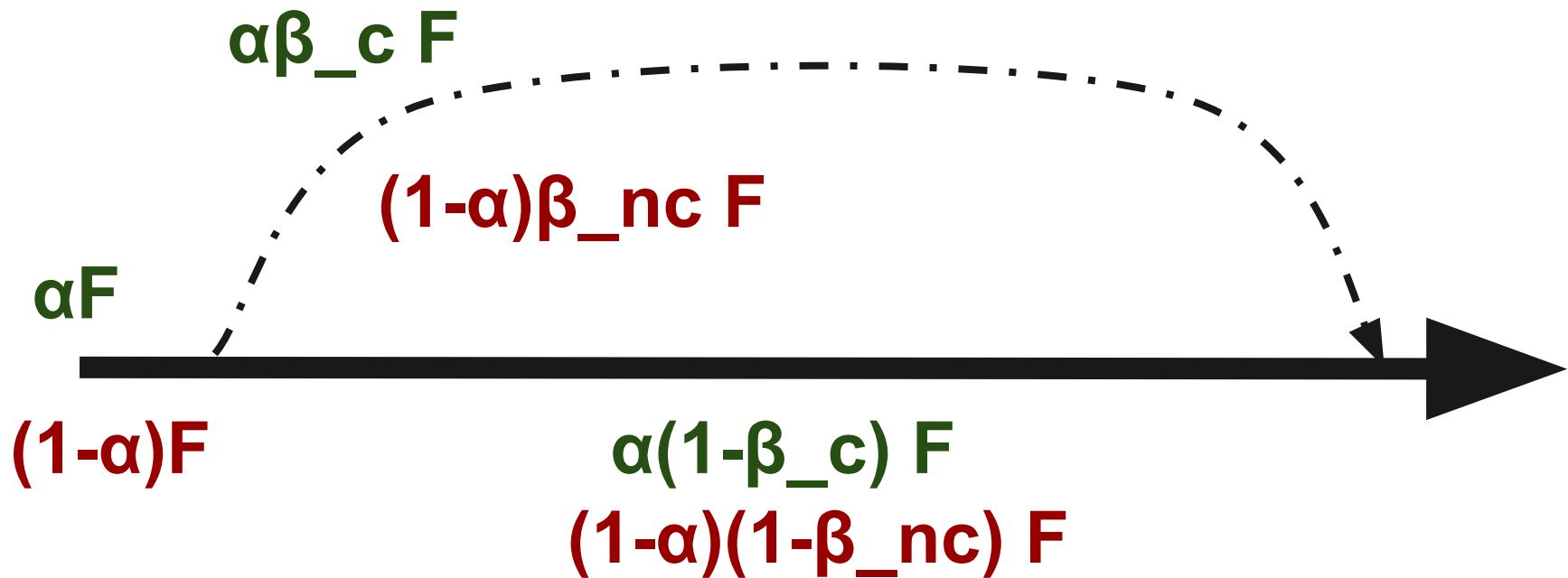
Freeway I210

Overused, congested,
incident

Freeway corridor



Choosing optimal split ratios



- In static case (equilibria behavior):
 - How to compute Nash behavior for vehicular traffic?
 - Equilibria on horizontal queueing networks.
 - How will non-compliant drivers respond to partial compliance?
 - Stackelberg games.
- In dynamic case:
 - How to choose compliant split ratios effectively?