Urban gridlock: Macroscopic modeling and mitigation approaches

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Transportation Research Part B (in press)

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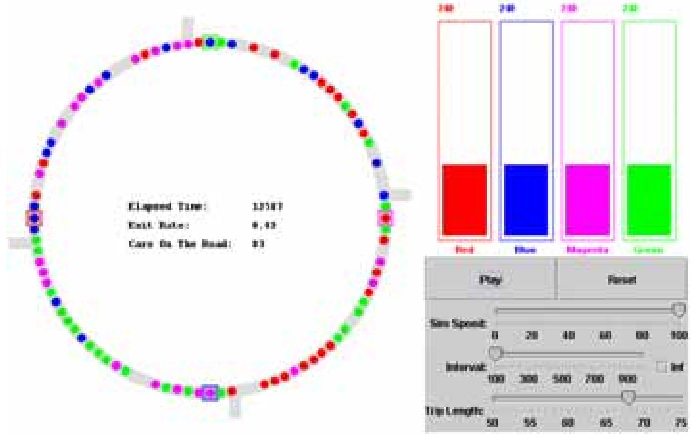
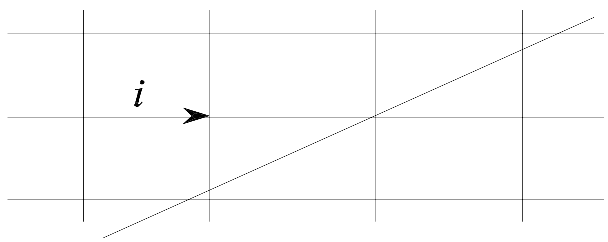
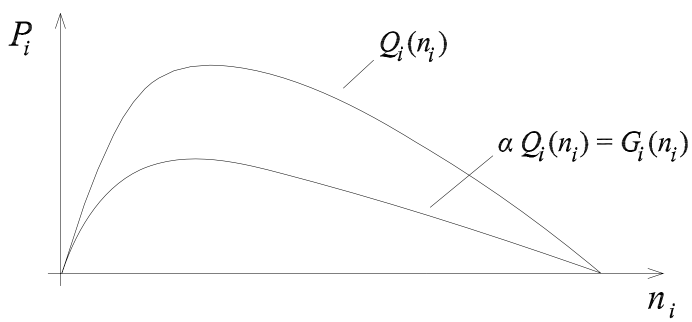
KEY ISSUES

- MOBILITY IMPROVEMENT APPROACH
  PROPOSE→ EVALUATE→IMPLEMENT
- FRAGILE EVALUATION MODELS
  - Inputs unreliable
  - Outputs unpredictable
- WHAT TO DO?
- ROBUST APPROACH
  PROPOSE→ MONITOR→MODIFY
- BUT IS IT POSSIBLE?



DEFINITIONS



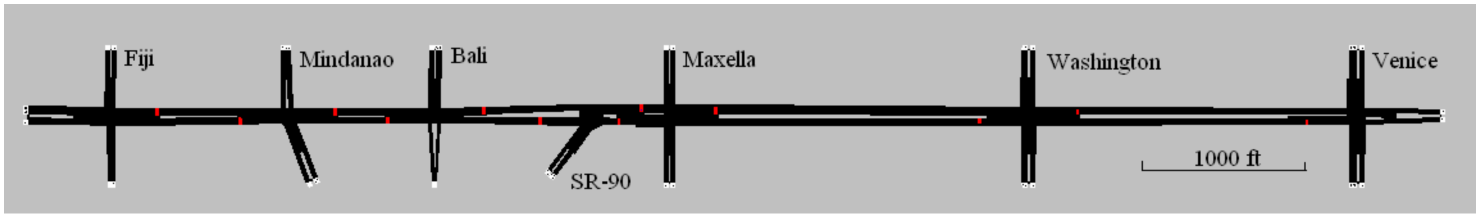


Accumulation : n_i (vehs)

Travel Production : $P_i = n_i \cdot u_i$ (veh-km/hr)

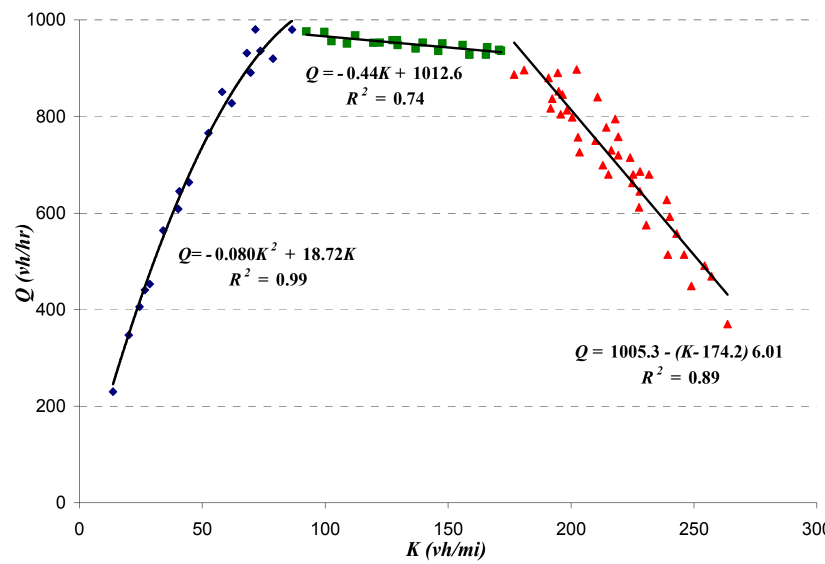
Output : $E_i = n_i \cdot u_i \cdot \alpha_i$ (vh/hr)

AGGREGATION HYPOTHESIS

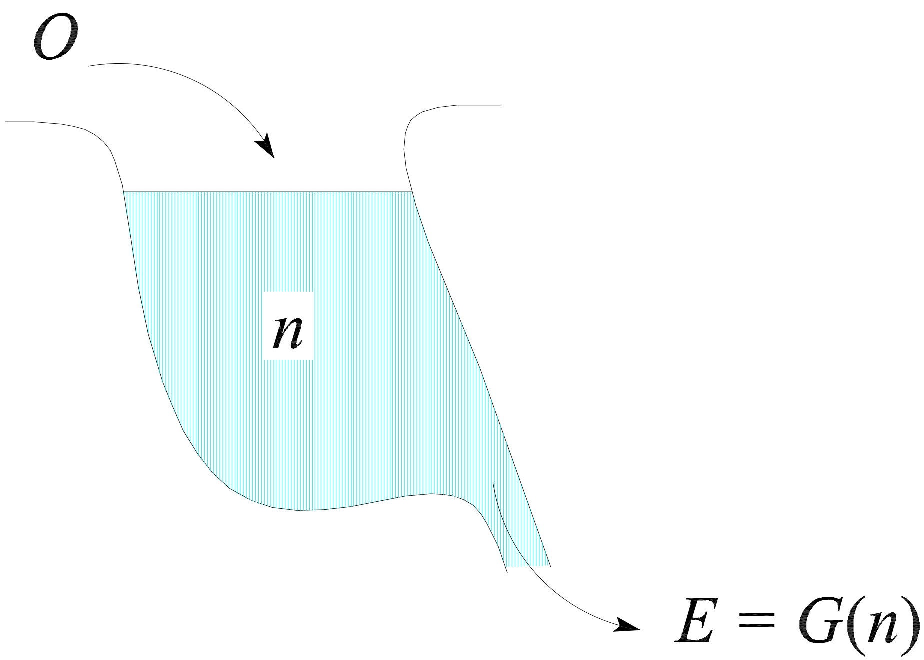


$$P = \sum P_i = \sum Q_i(n_i) \cong Q\left(\sum n_i\right)$$

$$E = \sum E_i = \sum G_i(n_i) \cong G\left(\sum n_i\right)$$



AGGREGATE DYNAMICS



Given : Q, G

Control : $O(t)$

Monitor : $n(t)$

Maximize : $\int E(t)dt$

$$\frac{dn(t)}{dt} = O(t) - G(n(t))$$

POLICY : $n^*(t) \approx n_{crit}$

PROPERTIES OF POLICY

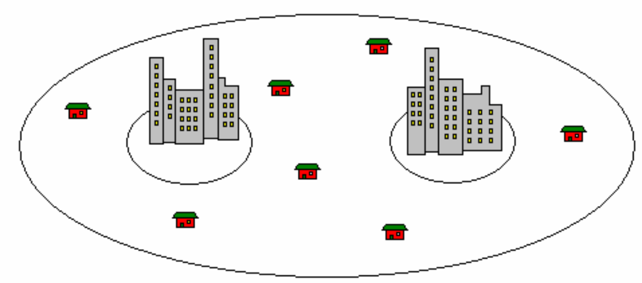
- Observable (monitor)
- Robust (no forecasts)
- Pareto Efficient

ADDITIONAL INSIGHTS
AND CONCLUSIONS

- INVARIANCE PRINCIPLE 2:

  TRAFFIC vs.DESTINATION DENSITY

- Multi-Reservoir Systems



- Multimodal principles

- Tests and deployment

QUESTIONS

http://www.its.berkeley.edu/volvocenter/