



Pixel Oriented Mobility Modelling

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Characteristics

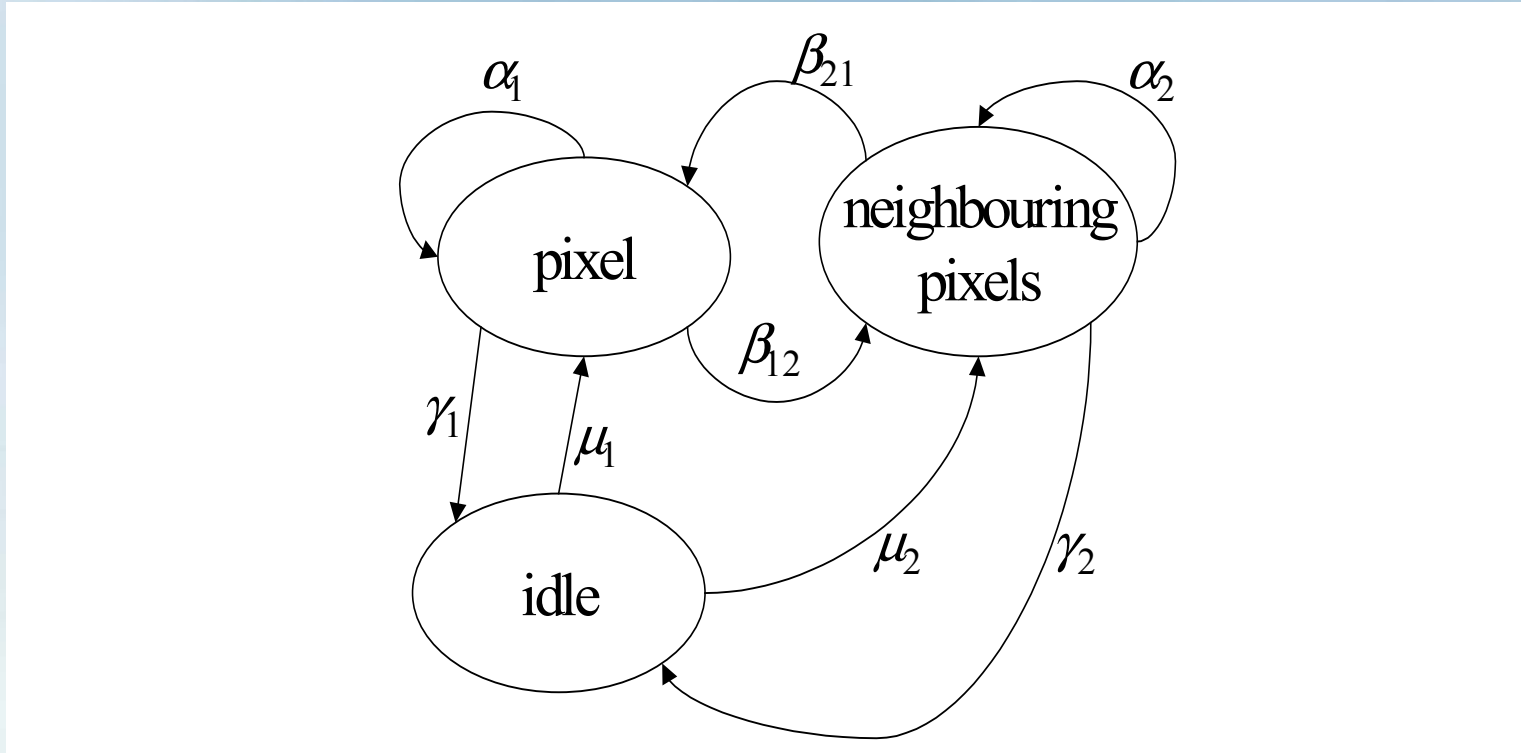
- **Mobility parameters are attributed to pixel (not to the user)**
- **However, it is possible to define few different mobility types**
 1. High speed vehicle (120 km/h)
 2. Medium speed vehicle (50 km/h)
 3. Pedestrian (3 km/h)
 4. Not moving



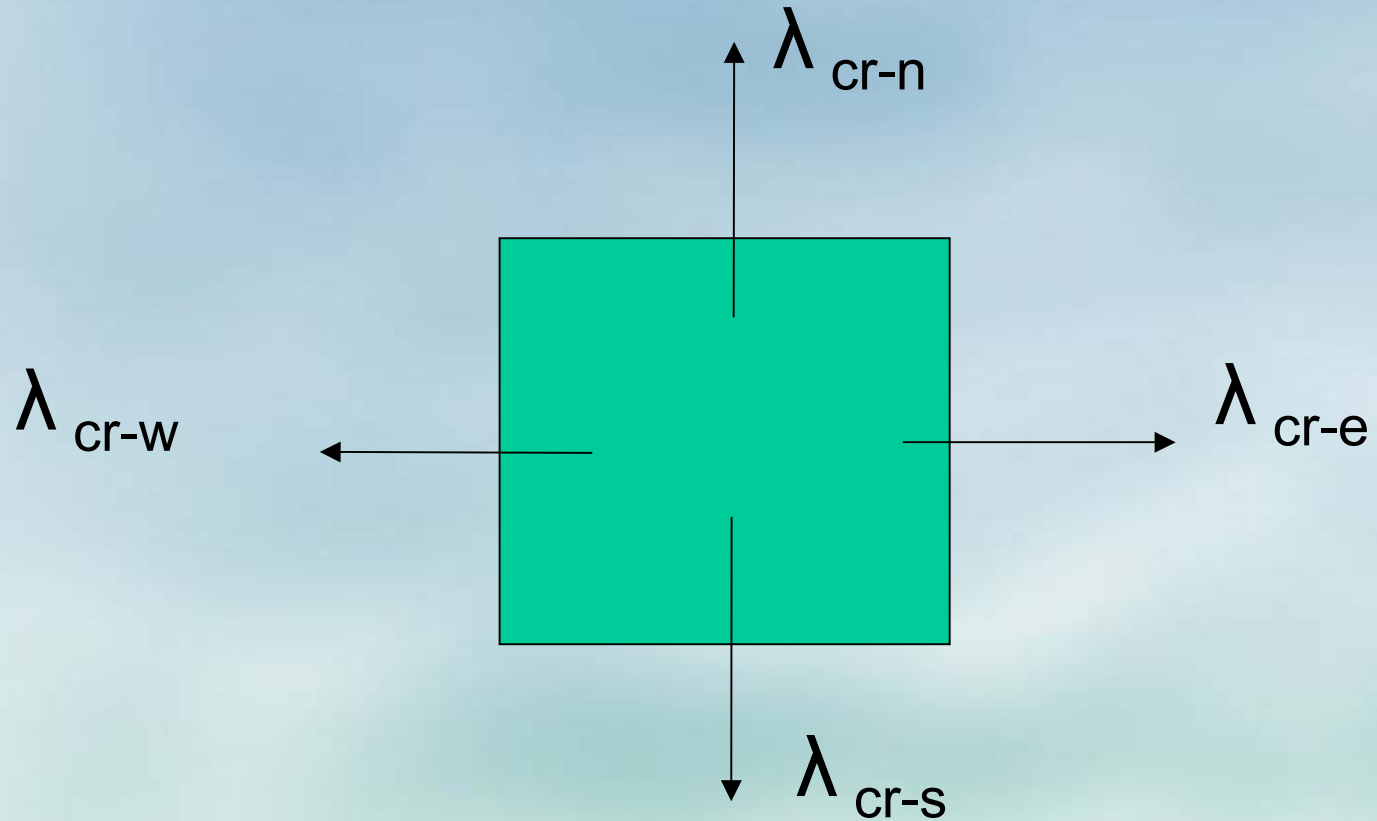
Switching from one Mobility type to other

- **In reality a user can switch his/her mobility type while calling**
- **However, in a stationary system, errors introduced by ignoring this effect can be neglected**

Markov-Chain Model

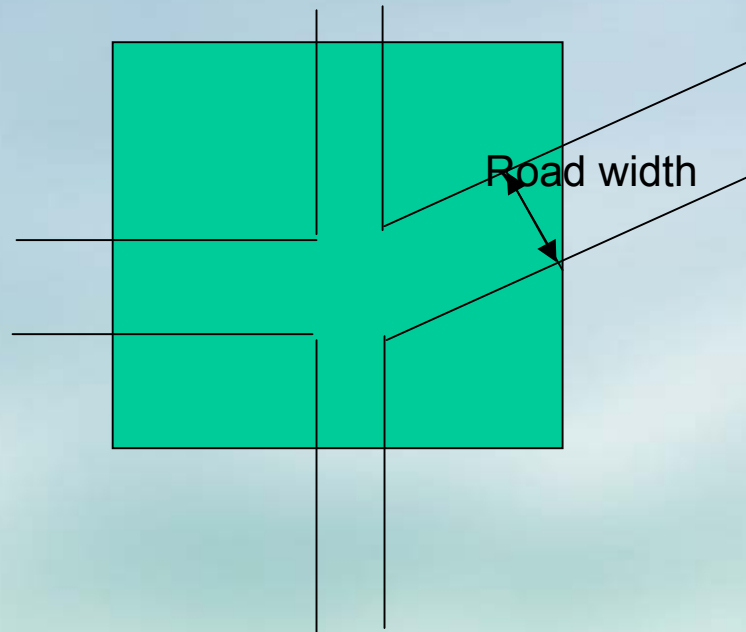


Crossing Rates



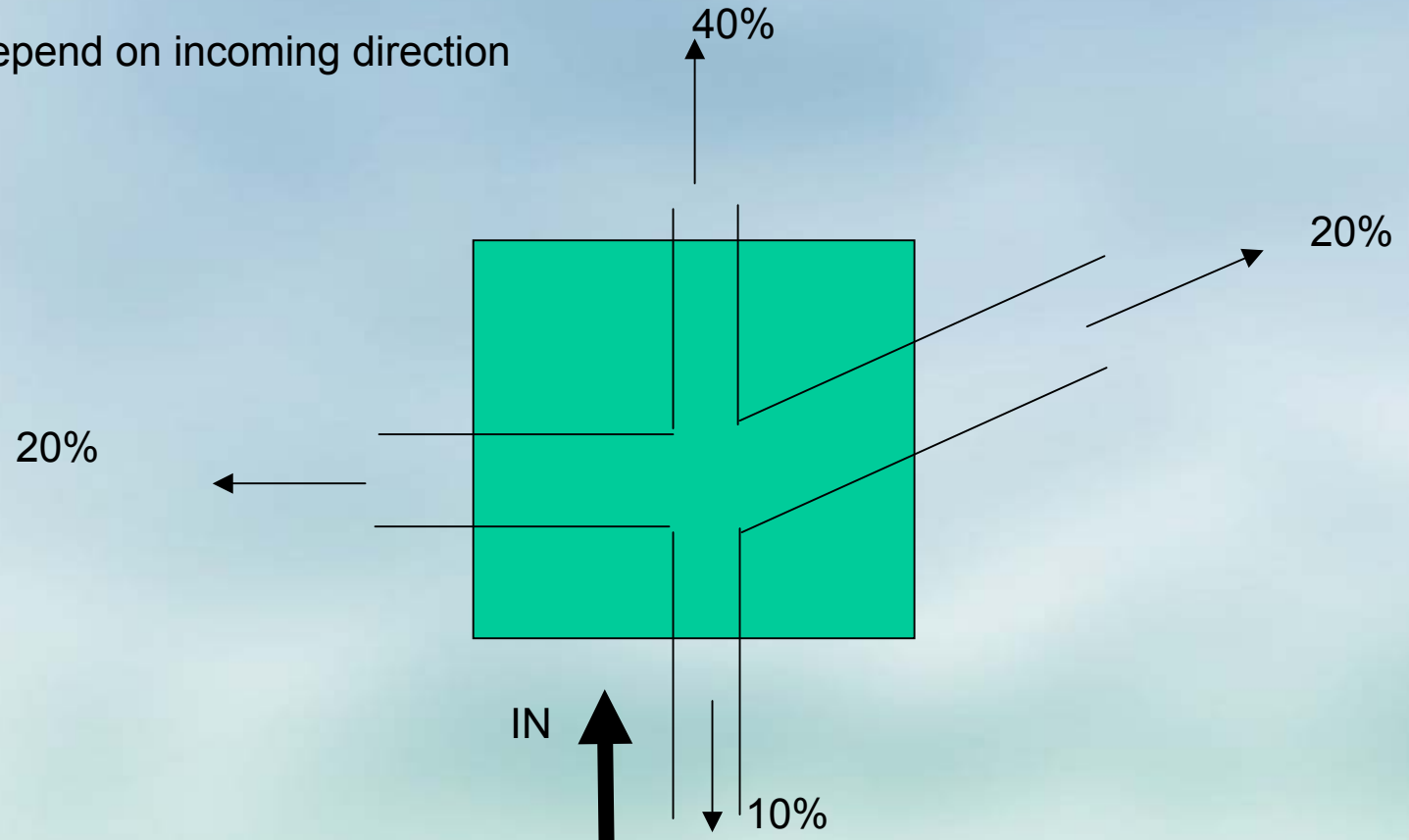
Crossing Rates: Estimation of

Crossing Rate \propto Road Width $\times \delta$



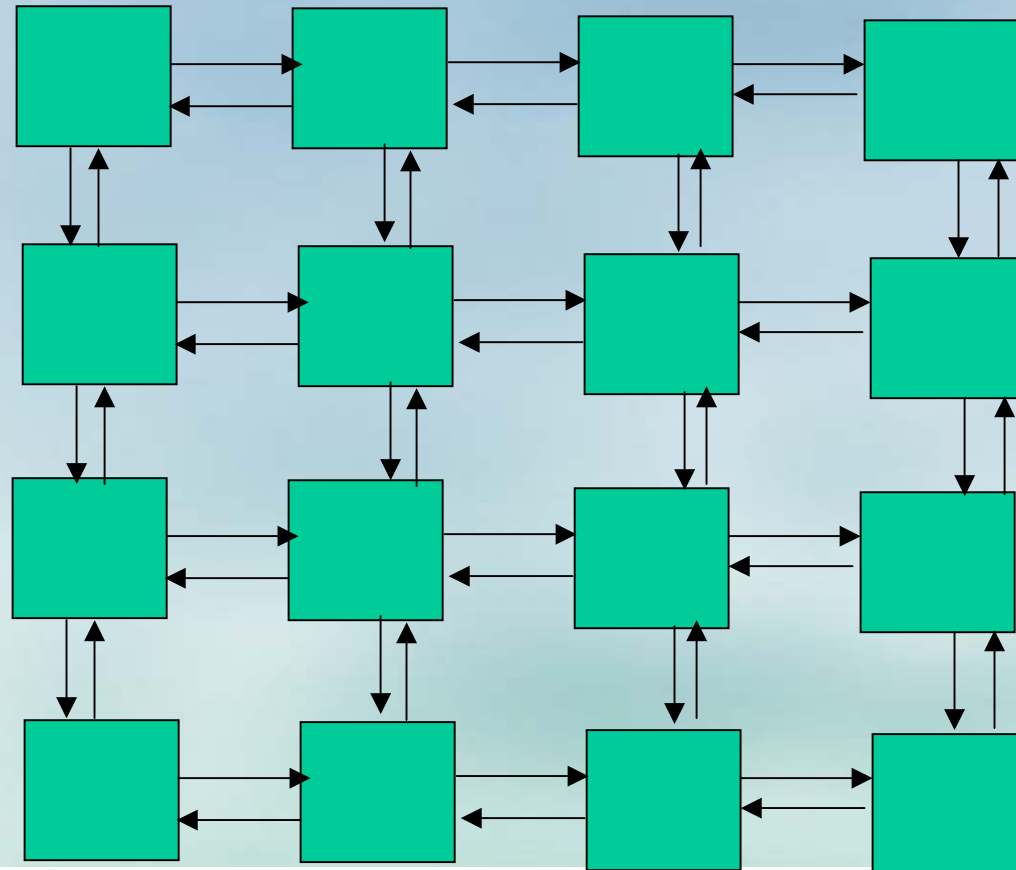
Short Memory Models

Crossing Rates depend on incoming direction





Mobility Grid





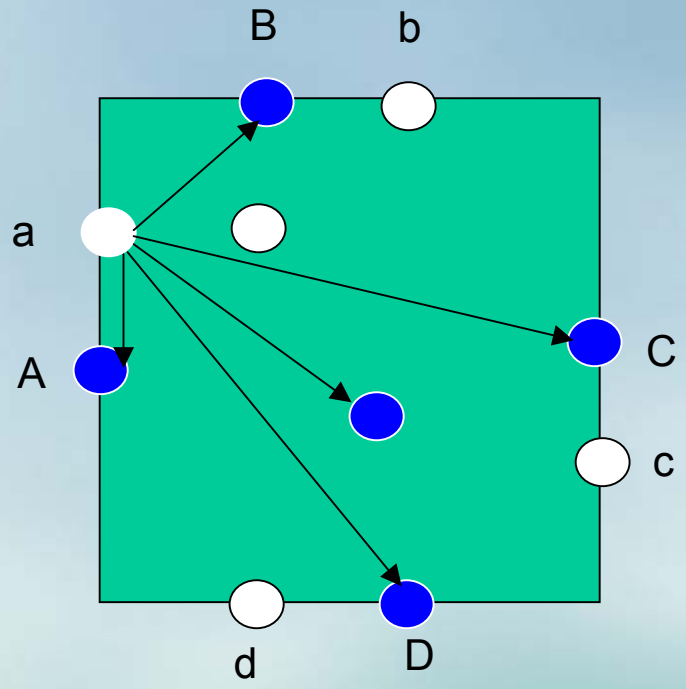
Condition for stationarity

- **The number of active users in a selected area should be stationary**
- $\sum \lambda_{cr_in} = \sum \lambda_{cr_out}$

Condition for stationarity

- Σ calls emerging = Σ calls terminating
- Σ calls emerging and leaving
= Σ calls entering and terminating
- $\lambda_s (1 - P_{ST}) = P_T \Sigma \lambda_{cr_in}$
 - P_{ST} : Probability that an emerging call terminates before moving to next pixel
 - P_T : Probability that a call entering the pixel terminates before next pixel

Entry and Exit points



Mean Number in pixel

$$\rho^T = \lambda^T \{Q (\sum_{k=0, \infty} P^k) Y + D\}$$

ρ : Pixel occupancy vector

λ : Arrival rate vector

Q: entrance Probability matrix

P: Pixel to Pixel Transition matrix

Y: Pixel aggregate time matrix

D: Call Duration matrix (in first pixel)

Concept Developed in IST-Project Momentum (IST-2000-28088): A. Eisenblätter, E. Fledderus, R. Perera



Thank You for your Attention