

[Technologies for Safe and Sustainable Road Traffic Society]

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The studies in the laboratory are related to traffic engineering from various aspects such as fundamental theoretical studies, analyses of data collected by different types of sensors, and the effect evaluation of traffic management methods/policies based on traffic simulation models. They are expected to resolve the traffic safety, congestion and environmental impact issues, and to lead to innovative road traffic.

The goals are to develop policy-assessment tools for safe, efficient and environmentally sustainable traffic society.

Scientific Approach for Traffic Flow

Innovative policy

Studies on various traffic policies to safely and efficiently manage urban traffic flow:

- Network control based on spatial congestion patterns
- Comparison of different midblock crosswalk treatments
- Optimal traffic assignment with maintenance cost
- Control for mitigating gridlock state

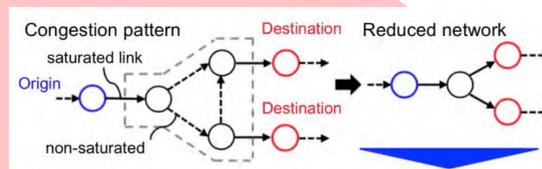
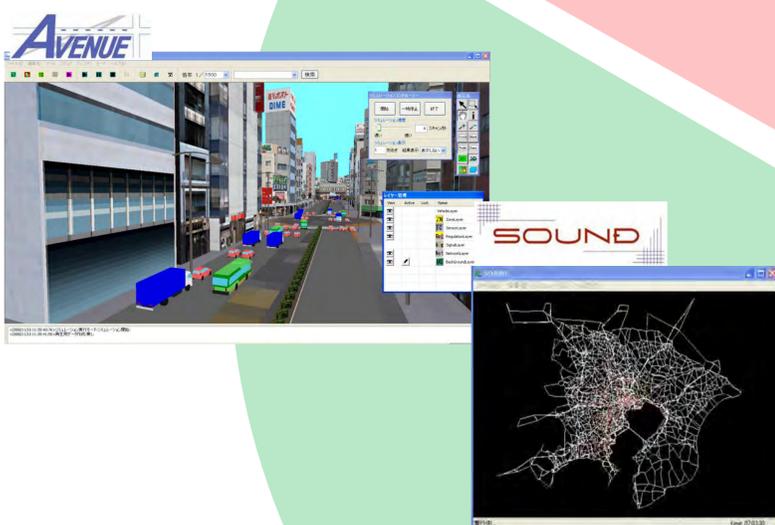


Fig. Proposal of analytical formula of network throughput based on reduced network structure

[Analytical Formula of Network Throughput (one-to-many)]

$$\bar{f}_d = \mathbf{T}^{-1} \mathbf{V}_{dd} \bar{\tau}_d - \mathbf{T}^{-1} [\mathbf{V}_{di} (\mathbf{V}_{ii})^{-1} (\mathbf{V}_{id} \bar{\tau}_d - \delta_i) + \delta_d]$$

$\mathbf{V}_{ab} \equiv \mathbf{A}_a \mathbf{M} \mathbf{A}_b^T$, $\mathbf{T} \equiv \text{diag}[\dots, \bar{\tau}_d, \dots]$, $\mathbf{M} \equiv \text{diag}[\dots, \mu_i, \dots]$
 \mathbf{A}_a : Node-link incident matrix (reduced network) μ_i : capacity of link i
 i, d (subscript): corresponding to transient and destination nodes

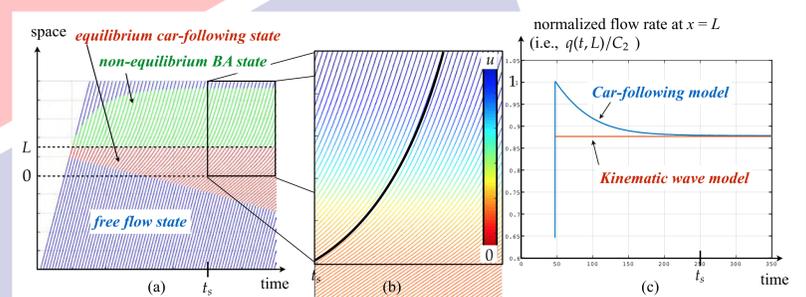


ITS INTELLIGENT TRANSPORT SYSTEMS

Development of traffic simulation models and its application to policy evaluations

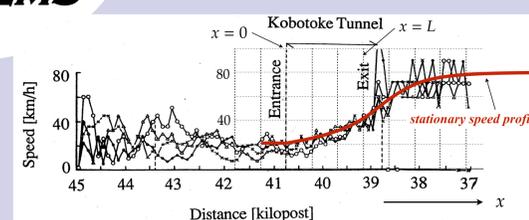
- AVENUE (Street-level traffic simulator)
- SOUND (Regionwide-level traffic simulator)
- Operational evaluation system for 3 ring roads in Tokyo metro area
- Case study of introduction of Bus Rapid Transit (BRT) system

Technology



Upper Fig. Analysis of formation of capacity drop state

Left Fig. Calibration result of Kobotoke tunnel data



Basic theories and empirical studies of traffic flow

- Theory of capacity drop of sag and tunnel bottlenecks
- Desired speed analysis using jerk minimization principle
- Pedestrian queue formation characteristics at bottlenecks
- Travel time estimation in mixed traffic

Science