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.

### 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

### 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

### Scientific Approach for Traffic Flow

**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

[Analytical Formula of Network Throughput (one-to-many)]
\[
\mathcal{L}_n = T - V_n T + T - (V_n V_n + T - V_n T - A) + A_n
\]

\(V_n = \text{node-incident traffic (reduced network)} \quad C_n = \text{capacity of link (I/O)} \quad \mathcal{L}_n = \text{node-incident traffic (reduced network)} \quad \mathcal{L}_n = \text{node-incident traffic (reduced network)}

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

**Upper Fig. Analysis of formation of capacity drop state**

**Left Fig. Calibration result of Kobotoke tunnel data**

**Innovative policy**

**ITS Intelligent Transport Systems**