

Motorway Gap Distribution Analysis for Designing Dedicated Connected-and-Automated-Vehicle(CAV) Lanes

自動運転車専用車線の設置要件の検討に向けた高速道路におけるギャップ分布の分析

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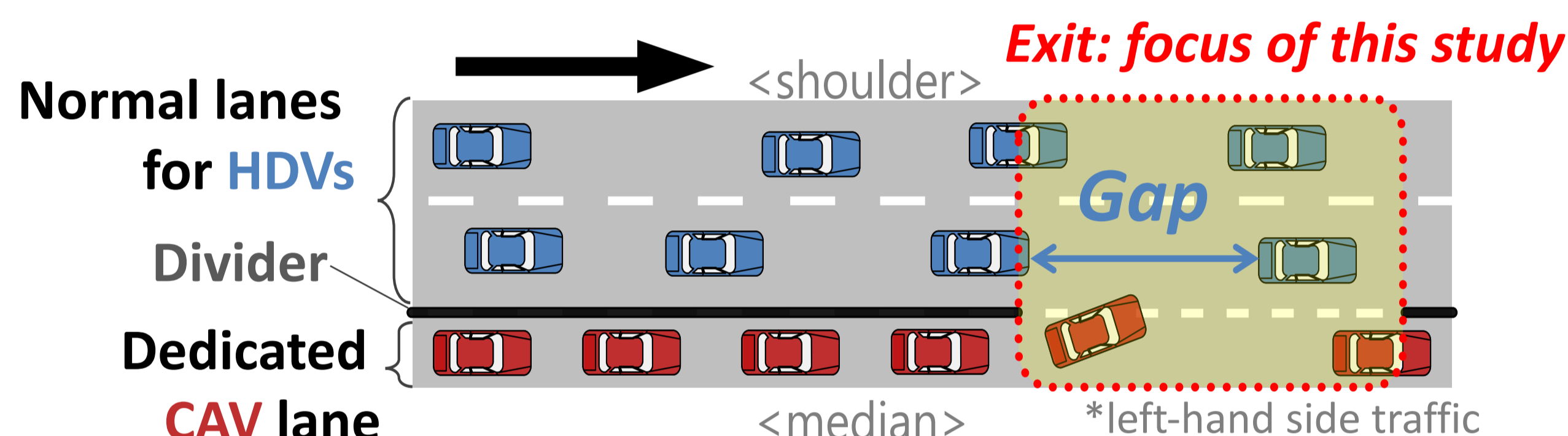
<http://www.transport.iis.u-tokyo.ac.jp/>

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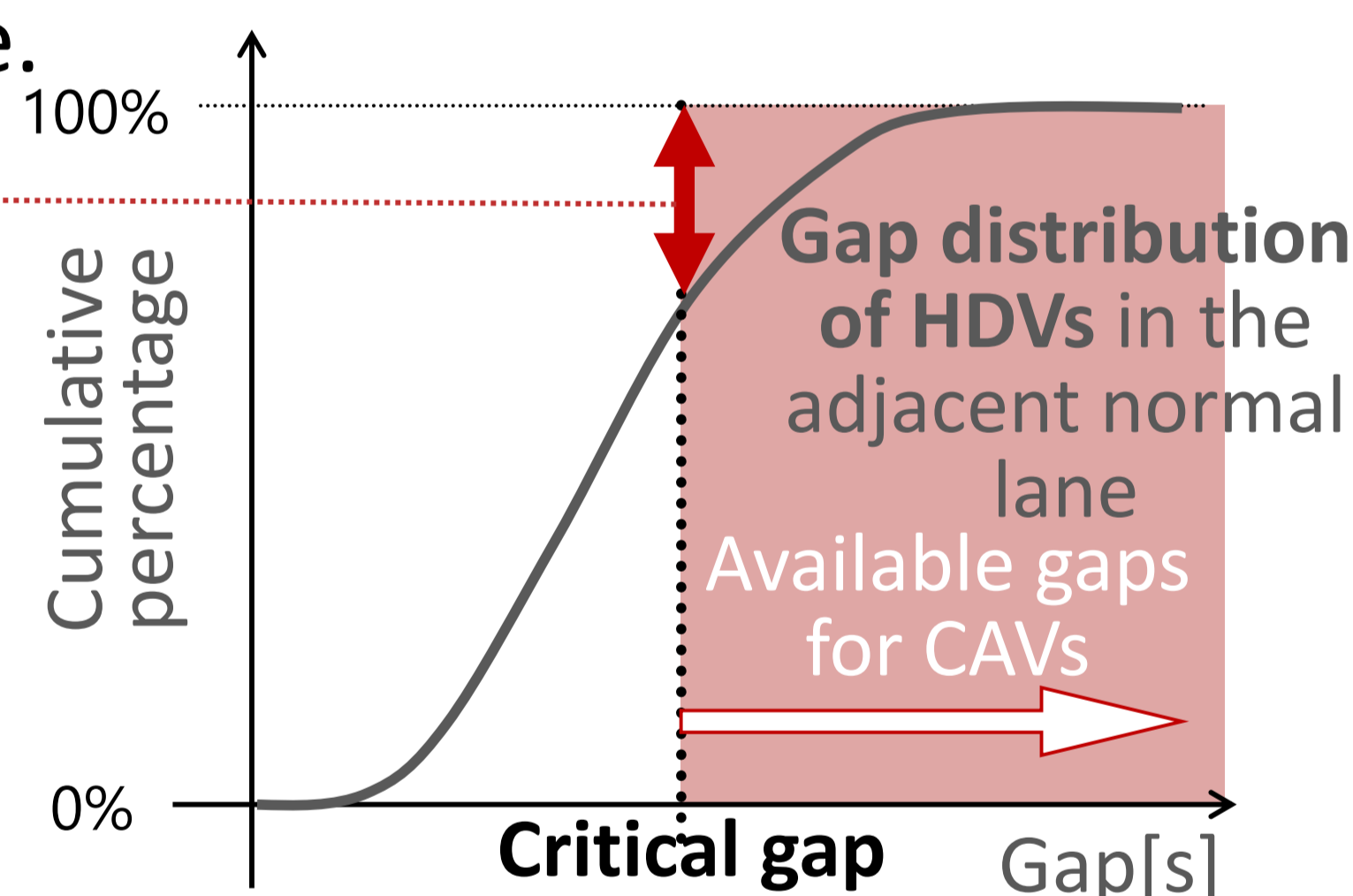
1. Introduction

- CAV have the potential to improve traffic capacity and relieve congestion.
 - It will take long time to fully replace human-driven vehicles (HDV) with CAVs
 - Long transition period of mixed CAV and HDV flow
 - Possible way to facilitate the early introduction of CAVs is to provide dedicated CAV lanes.
- Motivation:** To design exit for dedicated CAV lane
- Objective:** To understand the spatiotemporal characteristics of HDV gap distributions.



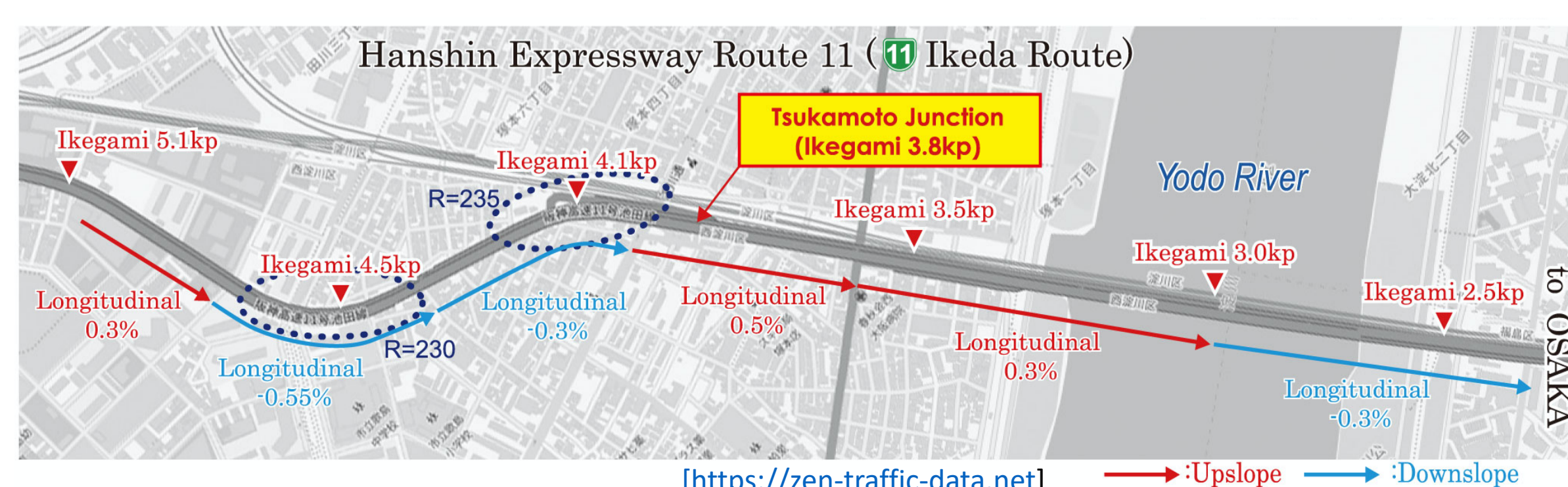
2. Methodology

- Critical Gap** is the smallest gap allowing vehicles from a dedicated CAV lane to merge with the adjacent normal lane.
- Available Percentage** is defined as the percentage of available gaps longer than the critical gap.
- Available Percentage is calculated at different assumed critical gaps



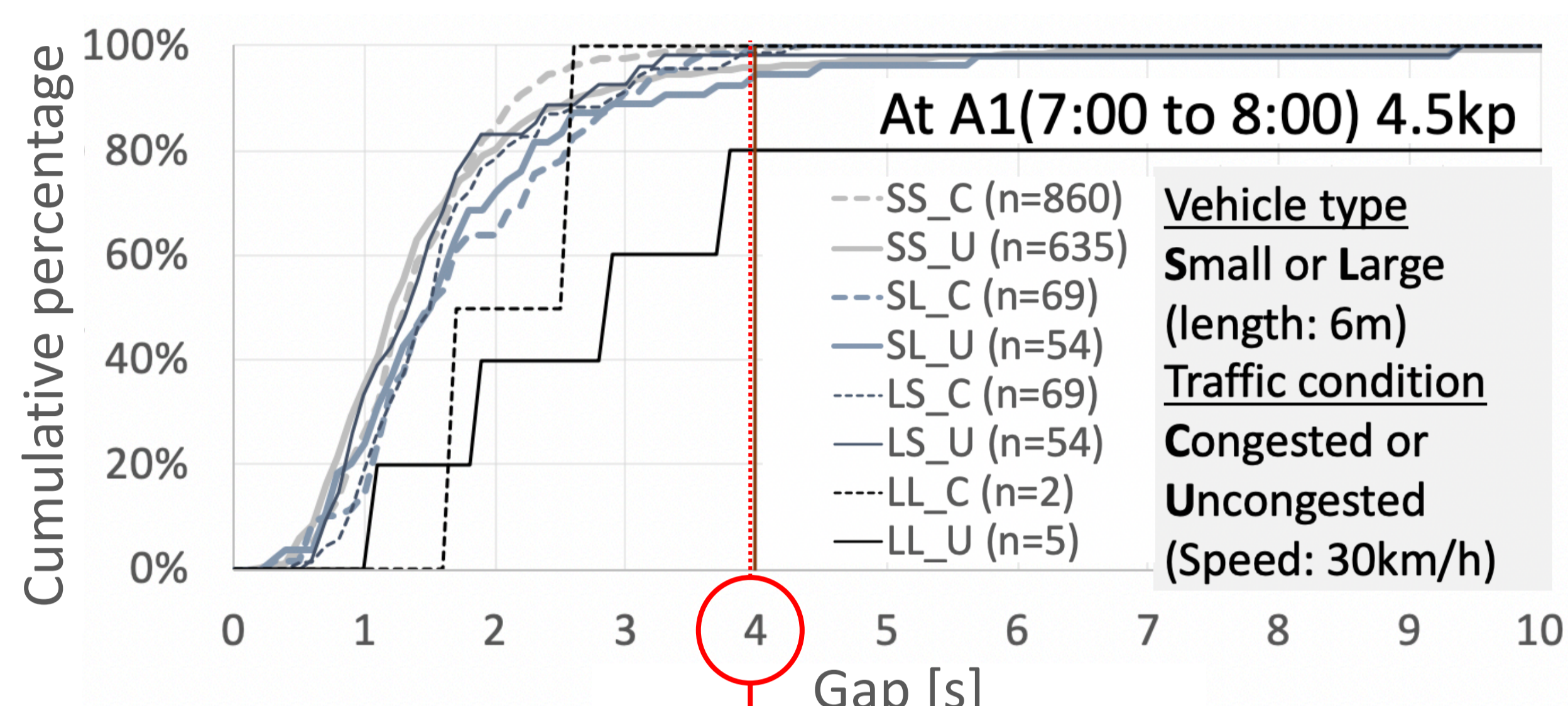
3. Subject Site and Data

- Pulse Data** [provided in Zen Traffic Data :<https://zen-traffic-data.net/>]
 - About 2-km section of the Hanshin Expressway Route 11 Ikeda line (bound for Osaka) ; 5.1kp -> 3.0kp
 - Two-lane, with curve, sag, merging, and river bridge ...only median-side lane is analysed
 - Five vehicle detectors (▼) for the pulse data
 - Collected in September 2018
 - 5 hours of time period (A1, A2, B, C1,C2)

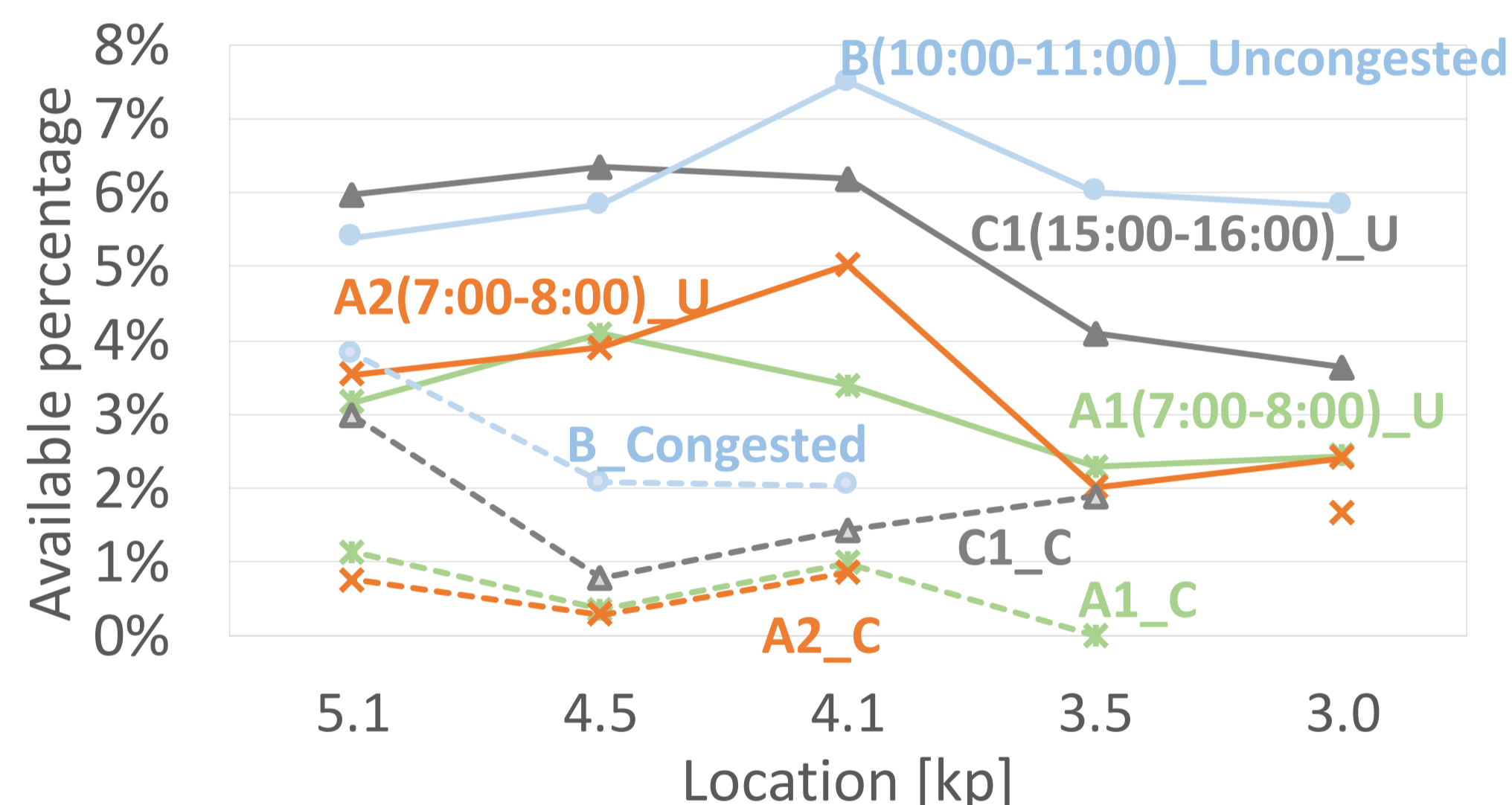


4. Preliminary Results

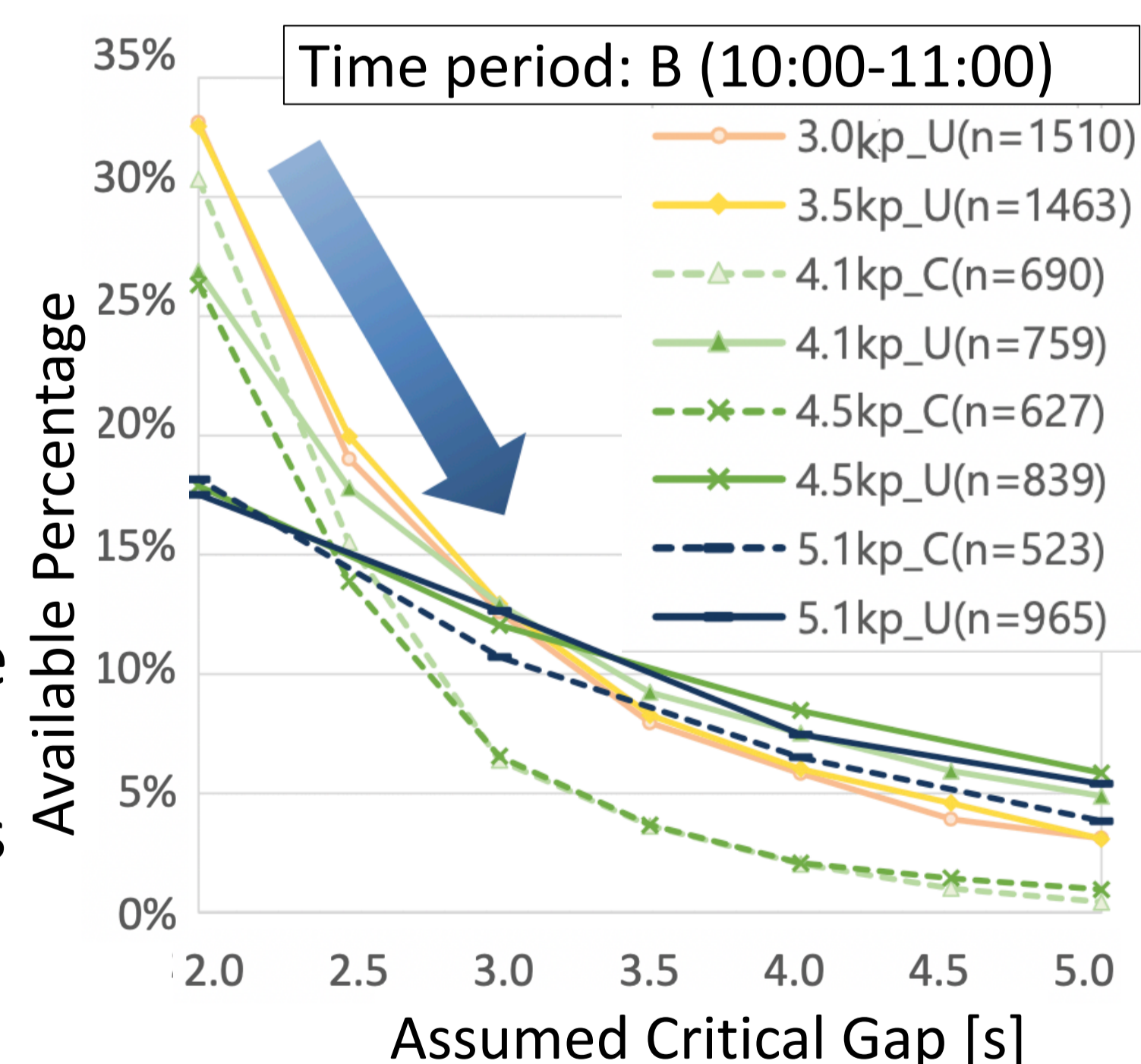
- Cumulative Gap Distribution
 - SS defines Small vehicle is followed by a Small vehicle.
 - C or U defines congested cond or uncongested cond.
 - With the presence of large vehicles, gaps are larger.



- Available percentage under 4-s critical gap (only Small-Small vehicles)
 - Lower in congested cond than in uncongested cond.
 - Relatively high from 4.5 to 4.1 kp



- Sensitivity of the assumed critical gap
 - Large reduction when the critical gap increase from 2s to 3s.
 - During congestion, available percentage is very small if the critical gap >3s



5. Summary

- Available percentage and its reduction with congestion differs by location
- Future work**
 - Investigate the impacts of geometry and traffic flow levels using more detailed information of gap distributions at different locations.
 - Final results would contribute towards the design of exit of dedicated CAV lane